INFLUENCE OF HEALTH SYSTEM DETERMINANTS ON AVAILABILITY OF MEDICINES IN PUBLIC HEALTH FACILITIES IN BUNGOMA COUNTY, KENYA

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DECLARATION AND APPROVAL

Declaration by the Student

I, the undersigned, declare that this thesis is my original work and that it has not been presented in any other university or institution for academic credit.

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Approval by the Supervisors

This thesis has been submitted for examination with our approval as university supervisors.

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DEDICATION

I dedicate this work to my wife and children for their patience and continuous encouragement during the research process.

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ABSTRACT

Availability of medicines is important in provision of health care. Lack of medicines has been a major challenge in public health facilities in developing countries including Kenya. This research aimed at determining the influence of procurement process, inventory management practices and healthcare financing on availability of medicines in Bungoma County, Kenya. Descriptive cross sectional research design with mixed approach methods was applied. The target population included the county pharmacist, sub county pharmacists, medical superintendents, procurement officers, health administrative officers, the county procurement officer and the chief officer for health and sanitation. All the nine sub county hospitals were sampled and a census method applied to sample four staff from each sub county with one staff being sampled from each cadre of the target population above hence 36 respondents. This was achieved through G- power Priori power analysis. Additionally, the county procurement officer, the chief officer for health and sanitation and the county pharmacist were purposively sampled. The resulting total number of respondents was 39. A semi structured questionnaire, an in-depth interview guide, and a checklist were the study data gathering tools. Data was analyzed qualitatively and quantitatively. Descriptive statistics were employed in quantitative data analysis while Chi-square was used as appropriate. The information was then tabulated. Logistic regression was used to explain relationship between dependent and independent variables. Qualitative data was categorized into specific themes as per the research objectives and reported in narrative form together with quantitative presentation. 81.2% of respondents reiterated that procurement processes were followed as compared to 18.8% where, laid down procurement procedures were not followed. Health administrative officers were a majority of those who reported adherence to these procedures while all the pharmacists and procurement officers said they had full adherence. There was no significant relationship between adherence to procurement procedures and the cadre of the health professional involved (χ^2 =2.230: p= 0.534). Inadequate funding, inadequate procurement staff and long procurement process were cited as challenges related to procurement of medicines. Inadequate funding was the main issue leading to stock out of medicines with 43.8% of respondents strongly agreeing to this statement while 46.9% plainly agreed. The influence of budgetary allocation was significant where subjects who said that budgetary allocation influenced availability medicine were included (OR=2.65, 95% CI, 0.737, 3.123), whereas the adherence to procurement procedures seemed to have a greater influence on the availability of medicines (OR=4.194, P=0.002). An average of 72.22 (63.35%) medicines were available, out of 114 that exist in the county's standard order and reporting form for hospitals. On the other hand, the county averaged 51.30 days of stock outs in a quarter of a year. Absence of a county central store, an unreliable inventory management system, and an insufficient number of pharmaceutical professionals constituted the inventory management problems. The findings of this study will provide a baseline for further research in addition to providing insights on determinants of medicine availability. The government needs to streamline procurement, support inventory management practices and increase funding for medicines to ensure availability of medicines.

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LIST OF ABBREVIATIONS AND ACRONYMS

ACT	**:**	Artemisinin Combined Therapies
AIDSP	**:**	Acquired Immune Deficiency Syndrome
AL	**:**	Artemether- Lumefantrine
EML	**:**	Essential Medicines List
EPI	**:**	Expanded Programs on Immunization
HAI	**:**	Health Action Initiative
HIV	**:**	Human immunodeficiency virus
KEMSA	**:**	Kenya Medical Supplies Authority
KNDP	**:**	Kenya National Drug Policy
MOH	**:**	Ministry of Health
RUM	**:**	Rational Use of Medicines
TB	**:**	Tuberculosis
WHO	**:**	World Health Organization

CHAPTER ONE

INTRODUCTION

This chapter contains an overall overview of the thesis. It contains the background of the study, statement of the problem, justification, objectives of the study, research questions, and scope of the study, significance of the study, theoretical framework and conceptual framework of the study.

1.1 Background to the study

Pharmaceutical advances have to a great extent transformed health care over the last several years. This has made it easier for many disease conditions to be addressed either through prevention, cure, or management by prescription and non-prescription drugs. The World Health Organization (WHO) introduced the concept of Essential Medicines List (EML) in the year 1977 so as to standardize the type of medicines required to offer health services at each level of health services provision. The WHO develops a list of essential medicines after a thorough review and shares it with all countries which in turn develop their own country-specific lists basing on the WHO model draft (Bruno et al., 2015). Despite of this, several countries still struggle with the challenge of unavailability of medicines to an extend that about 30 % of the world's population lack medicines they so much want.

The situation is even worse in poor countries especially in Asia and Africa where up to 50 % of the inhabitants have no access to essential medicines (Bruno et al., 2015 & WHO, 2004). EMLs have also impacted medicine supply, resulting in a higher supply of essential medicines, especially in the public sector and in low and lower middle-income countries. However, equal access to essential medicines, especially in the public sector, is not guaranteed (Bazargani et al., 2014).

Lack of medicines in public health facilities is one of the barriers to accessing health care services. Public health facilities have an availability of generic essential medicines of less than 60% in all WHO regions. This ranges from 32% to 58% in Eastern Mediterranean Region and European Region respectively. This is way lower as compared to the availability of similar medicines in private health facilities across all regions. However, in Western Pacific, South- East Asia and Africa Regions, the availability of essential generic medicines is still less than 60% in the private health sector (WHO, 2011).

The Kenyan situation is not different from what the above studies found out. According to a study conducted in Kenyan health facilities, public health facilities experience stock-outs of vital drugs for an average of 46 days every year, ranging from 30 to 90 days (Ministry of Medical Services and Ministry of Public Health & Sanitation, 2009). Another research by the WHO in 2010 in 39 low and low-to-middle income countries, including Kenya, observed that the mean availability of essential medicines varied greatly – around 20% in the public sector and 56% in the private sector (WHO, 2010).

Supply of medicines and other health products and technologies was mainly a role of the Kenya Medical Supplies Authority (KEMSA) prior to the devolution of health services in Kenya. However, since the adoption of the current constitution, most aspects of the public health sector were devolved and thus the supply of pharmaceuticals is a responsibility of the county governments. The national government only remained with the roles of policy making, training and regulation (Constitution of Kenya, 2010).

The evident lack of medicines in public health facilities poses a challenge to the facilities, and more often, they are forced to utilize funds meant for development and other expenditure to procure emergency medicines from private pharmacies (Orengo,

2012). This challenge is the same across most health facilities in Kenya. For instance, in Nakuru in the year 2010, all public hospitals had an average availability of 50% for common classes of medicines, while health centers and dispensaries had an average of 60% of essential medicines available (MOH, 2010). In the following year, 2011, hospitals had an average availability of 53% for essential medicines and lower-level facilities had 60% (MOH, 2011). In the two cases above, about two to three essential medicines were stocked out in each of the major classes identified. The situation was similar across the district with very minimal differences existing.

This study aimed to find out the influence of selected health system determinants on availability of medicines in Bungoma county's public health facilities. It focused on procurement practices, inventory management practices and healthcare financing and their influence on availability of medicines.

1.2 Statement of the Problem

Frequent stock outs of essential medicines in public health facilities diverts patients visiting these facilities with a hope of getting affordable and otherwise subsidized medicines to private health facilities and pharmacies. The cost of healthcare and particularly of medicines in such facilities is usually high and most of the time is unaffordable by a majority of patients (Magak and Muturi, 2016).

Counties have been allocating a significant proportion of their budgets towards the health docket. However, a huge percent of the health department's allocation, up to more than 90% in some cases goes towards recurrent expenditure. Bungoma County for example, in 2018/2019 financial year, allocated about 40% of its budget to the department of health and sanitation (Controller of budget, 2018). This is way above the recommended 15% as per the Abuja declaration, 2001. About 97 percent of this was

however, allocated towards recurrent expenditure, leaving a paltry 3% for development including purchase of essential medicines (Controller of budget, 2018).

Lack of medicines in public health facilities is common in the current devolved system in most counties in Kenya and in particular, in Bungoma County. Most health facilities experience medicines stock outs from time to time, making it incredibly difficult for them to continue providing the health care that they should. Patients are often required to purchase drugs from private pharmacies, which are costly due to high markups in the supply chain. In 2017, Bungoma County Referral Hospital, the main public health facility in the county was hit by an acute shortage of medicines after KEMSA cut off supply over a Ksh 21 million debts. This shortage included very basic medicines such as painkillers, anti-malaria medicines and other medical supplies (Jackson & Gertrude, 2017). Counties have continued to owe KEMSA huge amounts of money for medicines already supplied. In January 2020, for instance, counties owed KEMSA about Ksh 2.8 billion. Bungoma County still featured on this list with a KSh 84.9 million debts (Magdaline Saya, 2020).

Prior to devolution, health facilities used to make orders to KEMSA on a quarterly basis using a standard ordering and reporting form. The national Ministry of Health used a ‘pull’ system for medicines management and supply for public health sector and allocated a fraction its budget to KEMSA. The order amount was limited to a specified value as per the allocated drawing rights (Tsofa et al., 2017). This has ever since changed with counties making irregular orders of differing values. In the 2018/2019 financial year for instance, Bungoma County made only two orders to KEMSA for pharmaceuticals instead of four as it was the case earlier (KEMSA LMIS-V2, 2019).

The inconsistencies in the pharmaceutical supply chain and thus unavailability of medicines have been there for some time now and more so with devolution of health

services in Kenya. The health system determinants for this have however not been clearly identified in the existing literature and this research sought to find out the root cause of this problem.

1.3 Purpose of the study

The purpose of this study was to determine the influence of procurement process, inventory management practices and health care financing on availability of medicines in public health facilities in Bungoma County.

1.4 Objectives of the study

1.4.1 General objective

To assess the influence of health system determinants on availability of medicines in public health facilities in Bungoma County.

1.4.2 Specific objectives

1. To determine the influence of procurement process on availability of medicines in public health facilities in Bungoma County.
2. To find out the influence of inventory management practices on availability of medicines in public health facilities in Bungoma County.
3. To establish the influence of healthcare financing on availability of medicines in public health facilities in Bungoma County.

1.5 Research questions

1. What is the influence of the procurement process on availability of medicines in public health facilities in Bungoma County?

2. What is the influence of inventory management practices on availability of medicines in public health facilities in Bungoma County?
3. What is the influence of healthcare financing on availability of medicines in Bungoma County's public health facilities?

1.6 Significance of the Study

Medicines are key components of healthcare delivery. Their availability is therefore necessary for a successful health system. Very little literature exists on this topic particularly literature focusing on availability of medicines in Bungoma county. The findings of this study provide an important body of knowledge on to which future research work can be anchored.

This study unearthed the causes of the unstable supply of medicines in public health facilities in Bungoma County with respect to health system determinants. Identification of these determinants and their influence on availability of medicines will help the relevant authorities to formulate best institutional policies and regulations that can sustain a constant and reliable supply of medicines in the county.

The findings of this study will greatly benefit healthcare managers as they will be aware of the real issues that affect availability of medicines in the county's healthcare system. They will therefore be in a position to make sound decisions as it regards the supply of medicines. The outcome of this will be improved medicines availability in the county's public health facilities and in the long run, health care outcomes will be improved hence reduction in cases of mortality and morbidity.

The general public will also benefit from the findings of this study as they will be informed about the determinants of medicines availability hence will be in a position of understanding.

1.7 Scope and Delimitation of the Study

This research was focused on unveiling the health system determinants of availability of medicines in public health facilities Bungoma County. It was conducted in selected public health facilities within the county so as to meet its objectives.

1.8 Study limitations

This study was limited owing to the fact that it only focused on public health facilities in one county. In addition, it only involved a few health facilities. This was overcome by recruiting all the study population elements as participants and having comprehensive data collection tools in order to capture all aspects of the research. Additionally, the power and the effect size that yielded the sample were appropriate and acceptable according to Howell (2010) that is power of 80% and effect size of 0.5. The researcher recommends further research in this area, with a wider scope so as to find out the determinants of medicines availability in this country.

1.9 Assumptions of the study

The study assumed that stocking levels of all public health facilities in Bungoma County was comparable. Further, it was assumed that the three determinants: procurement process, inventory management practices and health care financing have an influence on availability of medicines in the county.

1.10 Operational definition of terms

Essential Medicines- are those medicines that meet prioritized health care needs of a given population. Their selection is done with regard to disease prevalence, efficiency, efficacy, safety, and cost-effectiveness. Essential medicines are those that are included in both the hospital draft formulary and the Kenya Essential Medicines List for the purposes of this study.

Medicine - any medication for treatment or prevention of a disease

Consistency- supplier's ability to show they are reliable in addition to quality supply of goods or services. There should also be evidence of improvement with time.

Dispense- to supply a medicine or poison as per a prescription from a duly qualified officer – a medical doctor, dentist or veterinary surgeon.

Procurement- it is acquisition of goods and/or services at an affordable cost, with consideration to their quality and quantity in the right proportions, at the right moment, in the right place, and from the right source.

Health system determinants- these are factors that dictate the performance of health services that is procurement processes, healthcare financing and inventory management.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter outlines the review of literature carried out by the researcher. It is organized around availability of medicines, procurement process, inventory management practices and healthcare financing and their effect on availability of medicines.

2.1 Availability of medicines

Several studies and extensive research have been put in the area of availability, cost and affordability of essential medicines. Generally, there is a very low availability of medicines in most developing countries. According to a survey conducted in Kenyan health facilities, public health facilities face stockouts of basic necessary medicines 46 days per year. Supply chains in the public health sector are subject to several instabilities, with stock outs lasting up to 90 days (MOMS & MOPHS, 2009). The scarcity of necessary medicines is a major contributor to Kenya's poor health-care quality. According to the SARAM 2013 study, this is the case. Furthermore, medicine scarcity is a major factor in the underutilization of public health services (MOH, 2013a). Just 47% of clients were able to access all prescription medications, according to the 2012 Health Sector Customer Satisfaction, Employee Satisfaction, and Work Environment Survey, with the most common factors being drug unavailability (77%) and unaffordable cost (22%). (Omondi et al., 2012).

Generally, it has been found that there is a low availability of essential medicines in public health facilities that is between 29.4% and 54.4%. According to Cameron *et al*., (2009), affordability of medicines for both chronic and acute health conditions is also a

major concern since most of the population particularly in African settings cannot meet their cost.

Despite the increasing literature on availability of medicines, very little is available on medicines availability in public health facilities particularly in a devolved system. WHO/HAI has contributed a lot of data in the area of medicines availability through their several medicine pricings surveys. A remarkable milestone was realized after development of a manual by these two organizations in 2003 for testing and subsequent revision. All the surveys about medicine availability have revealed various barriers as far as medicine accessibility is concerned: high prices that result from high mark ups along the supply chain hence reduced affordability particularly for poor populations, and low availability of medicines. An analysis of the WHO/HAI survey found out that there was low availability of medicines in public health facilities compared to the private health facilities. Another study by Mendis *et al.* in 2007 on availability of medicines for heart conditions, diabetes, care of terminally ill patients among others showed a 5% availability (median) of the medicines that were included in this study in public health facilities. This study was carried out in six low- and middle-income countries with Malawi being the only African country to have been included.

Numerous literature that focuses on medicines availability at the level of an individual health facility do not make use of the methodology by WHO/HAI. A study on availability of anti-malaria medicines in Ghana showed that less than fifty percent of the health facilities that were sampled had the recommended first line medicine for treatment of malaria in stock. This is according to Buabeng *et al*. (2008). Most of these studies however, do not look at facility-based factors that determine medicine availability. A study by Kangwana *et al*. (2009) investigates the effect of the policy to stock Artemisinin Combination Therapies (ACTs) which are first line anti malaria

medicines for uncomplicated malaria in Kenyan public health facilities. The finding of this study is that the policy has been taken up in the health facilities but the stock- out rate of Artemether- Lumefantrine (AL) is still high. This study compares very well with that by Davis *et al.*, (2013) that analyses the availability of Artemisinin Combination Therapies in 5 countries that receive Global Fund support. Rural health facilities recorded higher stock out rates of ACTs as compared to urban health facilities in both Ghana and Kenya. Tumwine *et al*. (2010) looked at the levels of stock outs of medicines in a health facility in Uganda both before and after the change from the push system to the pull system. It was found out that the health facility had stock out rates that were higher while the push kind of system was in place than when under the pull system.

An essential drugs list was developed for the first time by the WHO in 1977 in a move to increase accessibility to medicines that meet the needs of a majority if individuals. This list is designed to show the medicines that meet the needs of a majority of individuals worldwide. It is currently referred to as the Essential Medicines List (EML). The current version was published in 2020 (World Health Organization, 2020). The EML has been adopted by many countries through creation of national essential medicines lists to address their unique disease patterns in affordable ways. The medicines in each country's EML slightly differ between countries owing to differences in epidemiological disease patterns. The EMLs enables health authorities to optimize pharmaceutical resources.

2.2 Effect of procurement practices on availability of medicines

The method of purchasing facilities, materials, and equipment in compliance with relevant laws and regulations is known as procurement. It can be done by a variety of public, corporate, global, and local organizations either globally, nationally, and internationally. (Josphat & Anthony, 2016).

Limited skills in procurement matters, inadequate health care financing, lack of pricing and supplier information, long procurement processes, unfair regulations among others negatively affect procurement processes in low-income settings (Kakwezi & Nyeko, 2010).

Effective procurement processes enable health facilities to select, forecast, and quantify pharmaceutical requirements at all times. In order to have quality medicines, proper management of tenders and the entire bidding process is essential since the right suppliers will be identified. Procurement of medicines is a complex process involving human resource investment, use of technology, policies, and appropriate structures and defining responsibilities of staff (Sylvia and Willy, 2015). These processes address specific organizational needs. Medicine's procurement management deals with market surveys, putting in place a database of suppliers, monitoring of the supply chain to report on under/over stocking and manage redundant or obsolete stock.

Important steps in procurement of medicines are availability of funds and proper quantification. Quantification is one of the core steps of acquiring medicines for public, private and humanitarian health facilities. Procurement of medicines begins with identification and decision on procurement requirements, placement of requisitions, request for quotations, review of the quoted bids, contract awarding, delivery of medicines and payment. For these processes to be effective, proper mechanisms must be in place (MSH, 2013).

Inadequate technical capability, inefficient preparation and forecasting, and the use of outdated procurement processes are all problems that public bodies responsible for medicines procurement face. This leads to high drug prices and the resulting commodity instability. Essential medicines and health commodities are procured through a national public procurement scheme. Many developing countries have had a paradigm shift towards decentralization of public procurement as opposed to a centralized one. This has been made possible by changes in the legislative provisions so as to have involvement of the locals in decision making and possibly increase availability of medicines at the lowest levels of health service delivery (Arney & Yada, 2014).

Procurement planning affects distribution of medicines to a great extent. It ensures that transportation of drugs from suppliers and distributors is done on time to avert unnecessary delays that would otherwise occur. Additionally, proper procurement planning helps minimize total cost of drugs while at the same time maximizing on the service delivery hence a general improvement of the pharmaceutical distribution system. The outcome will be enhanced availability of medicines in public hospitals and ultimate reduction of inventory costs (Oyamo & Mburu, 2014).

Most developing countries experience difficulties in sustaining public supply chain systems. This is because of breakdowns that occur at multiple points in their procurement process. There is neglect, lack of leadership, poor co-ordination, lack of competition and transparency, corruption and human resource incompetence in public procurement systems. Inflexibility and bureaucracy in procurement contributes to contract delays, exaggerated costs, and contracts manipulation. This leads to slowness, ineffectiveness and corruption (Oyamo & Mburu, 2014).

In Kenya, public health facilities procure medicines and other medical supplies mainly through Kenya Medical Supplies Authority (KEMSA) and Mission for Essential Drugs and Supplies (MEDS). KEMSA was established in 2001 under an Act of parliament and its role is to procure, store and distribute medicines and medical supplies to the Public Health sector facilities (KEMSA website, 2016). KEMSA distributes medicines and medical supplies direct to the health facilities. Procurement at KEMSA is usually through international and national competitive tendering. In delivering its mandate, KEMSA continues to face numerous challenges mainly of bureaucratic nature that often result in long procurement lead times (Pfizer Global Health fellows, 2011). Additionally, KEMSA has had challenges associated with lack of autonomy until 2008 when there was a suggestion to delink it from the health ministry so as to make it an autonomous legal entity (WHO, 2014a).

Since the year 2013 when devolution of health care services was operationalized, county governments have no requirement to source medicines and other medical supplies from KEMSA. This is regardless of the fact that KEMSA has an advantage of bulk procurement and hence economies of scale. Further to this, most counties have no elaborate procurement plans and procedures for procurement of medicines leading to a risky compromise on the quality of medicines procured from other sources and an interference with the Kenya Essential Medicines List as provided by the national government's Ministry of health. The result of this has been frequent shortage of medicines, procurement of medicines at expensive prices and corruption (Gimoi, 2017). A study by Mutai in 2015 established that Isiolo County in January 2015 is said to have procured medicines and other supplies worth Kshs. 1.2 billion yet health facilities lacked the said commodities in spite of records indicating that they were delivered in December 2014. The study also revealed that the county did not have an elaborate

procurement process with suppliers not being properly identified and tenders not advertised as per the procurement regulations (Mutai 2015).

2.3 Inventory management practices and their effect on availability of medicines

Inventory control includes the supply chain management and continues to the point of use, where the goods are actually used to provide the intended service. A pharmaceutical inventory management system's key aim is to ensure that drugs are available in sufficient quantities to satisfy the needs of clients. This means that clients will get the right drugs, in the right amounts and at the right quality, at the right time and at a reasonable price (AMREF, 2007).

For effective distribution from the various warehouses, good inventory management practices should be followed. There are often several tiers between National Level Medical Store (NLMS) and health centers, which stock and refill orders from primary health care facilities. The outcome of this is overstocking, requirement for more labor to handle ordering process leading to high operational costs and numerous tasks for staff (USAID, 2011a). It is therefore important to balance funding across the distribution networks (Yadav *et al.*, 2011).

There are numerous reasons for low stock levels of medicines in public health facilities. These include Poor and/ or lack of quantification, inadequate consumption and stock status data, inadequate budgetary allocation and a poor physical infrastructure. This is evidenced by the situation in Nigeria according to a study by Transaid (Transaid, 2010a).

2.3.1 Stock Levels of medicines

Generally, Public sector health facilities and mission health facilities are not profit making. Therefore, they are guided by the essential drugs concept when procuring medicines and other medical supplies. However, it is important for managers of health facilities to be aware of the maximum and minimum stocks that a facility can accommodate so as to avoid going into high costs of maintaining too much stocks or the challenges associated with being under stocked.

Stock-outs of medicines in most set ups happen as a result of inadequate health care funding and lack of or inadequate aspects of commodity management like forecasting and quantification. This is the case in Nigeria (Federal Ministry of Health, 2010a). It is therefore important to have in place mechanisms for proper medicines management such as stock taking on a regular basis, stocks reconciliation among others to ensure proper inventory management.

2.3.2 Rational use of medicines and its effect on availability of medicines

The act of patients receiving medicines that are suitable to their health conditions, in individualized doses, for an adequate time period, and at the lowest cost to them and the whole community is known as Rational Use of Medicines (RUM). It can be summarized by the five rights – the right prescription drug, at the right dosage, by the right route of administration, at the right time, and for the right patient. When one or more of these conditions are not met, irrational medication use occurs (WHO, 2004). Inappropriate use of drugs contributes to wastage of essential medicines, which is a major contributor to medicines unavailability. Irrational use of drugs is a big issue all over the world, wasting scarce resources and posing widespread health risks (WHO, 2010).

In order to ensure rational use of medicines, it is crucial to have in place health care workers who are properly trained to handle issues of medicines use. Prescribing for instance should be done by clinicians while dispensing and general medicines management by pharmaceutical personnel. However, this is usually not the case especially in the Kenyan public health sector setting. In a survey by the ministry of health in 2009, few public and Faith Based Health facilities that is about 38 percent and 31 percent respectively were compliant with the legal provisions concerning professionals to be involved in dispensing of medicines. In licensed private drug stores, however, 81 percent of them had qualified pharmaceutical personnel. Dispensing in most public health facilities was mainly by staff that was not trained in pharmaceutical work which constituted about 42 percent. For Faith Based Health Facilities, 47 percent of dispensers were nurses while pharmaceutical technologists constituted 61 percent of dispensers in private pharmacies (MOPHS & MOMS, 2009).

2.4 Healthcare financing and availability of medicines

Numerous challenges do face supply chains particularly public supply chains. Available resources for health care provision in most countries have remained limited for a long period of time. This has led to stalling of many basic programs that were started long ago such as primary healthcare, Expanded Programs on Immunization (EPI), and family planning. In the recent past, major advances for priority health issues, that is Malaria, HIV and TB, have been rolled out. The funding for these is from Global Fund which help in supply of drugs, consumables, and equipment (Ann Ithibu & Djesika Amendah, 2019).

Healthcare is expensive to deliver. The United States (US) for instance spent about $ 3.0 trillion dollars in 2014 which translates to about 17.5% of its gross domestic

product (GDP) (US National Health Expenditures 2014 Highlights). This is a significantly higher percentage compared to the situation in other countries. A study by the Organization for Economic Cooperation and Development (OECD) indicated that in 2013, the US spent 16.4% of her GDP on healthcare compared to 11% for the next highest countries: Netherlands, Sweden, Germany and France (OECD, 2015).

Health-care financing sources for a long time have been general taxes, ear-marked taxes, insurance (private and social insurance), and direct out of pocket payments. Direct out of pocket payment is made at the point of healthcare service delivery. Insurance plans on the other hand pool resources together and offers benefits for subscribed members thereby spreading the risk of ill health across a large population. There are three main sources of healthcare financing currently in Kenya. These are government expenditure through budgetary allocations; direct out of pocket payments by patients and funding by donors (Kenya Healthcare Federation & Task Force Healthcare 2016). Of the three, donor funds are the main source of funds for healthcare amounting to about 31% of total healthcare funding while government expenditure amounts to 29.3% (MOMs/MOPHs, 2009). A study by Oketch (2014) affirmed that health financing is majorly through taxes and donor funding. Similarly, the same study found out that exorbitant out-of-the pocket spending was a barrier to accessing health services. Other countries like Nigeria depend on health insurance as a mode of financing to their devolved healthcare (Olakunde, 2012).

Health services in Kenya were devolved from the central government to the county governments in July 2013. Consequently, finances for purchase of essential medicines were transferred to county governments through budgetary allocations. The counties were then left with the discretion of deciding where to procure medicines from (KEMSA 2013). Prior to the devolution of health services, the national government

procured medicines through Kenya Medical Supplies Authority (KEMSA). Orders were made to KEMSA by hospitals quarterly by using standard order forms provided by KEMSA. It was however evident that the order fill rate was very low and the order form contained only a limited number of medicines (The World Bank, 2009).

The main constrain for a majority of developing countries has been the challenge of inadequate funding to not only health services but also other key sectors. In 2001, African countries signed an agreement to be allocating 15 per cent of their budgets to the health sector in what it is referred to as the Abuja Declaration. This has however not been practically possible and some countries have had to reduce the allocation to health sector over the years (WHO, 2010). With devolution of health services in Kenya, several counties have been allocating very minimal resources to health, with a majority allocating less than 5% of their total budget to this crucial department. Most of this money is utilized for payment of salaries with very little left for purchase of medicines. There has also been evidence of delays in disbursement of funds from the national treasury leading to compromised delivery of health services and shortage of medicines (Kibui et al., 2015).

Literature on devolution of health services in Kenya suggest that inadequate financing is a major factor affecting delivery of health services in the counties, (Akacho, 2014). Owing to this fact, there is a pressing need to increase budgetary allocation to the health docket. It is however, evident that funds allocated to counties have not been utilized prudently such that there are reports that funding diversification, accountability mechanisms, finance policy guidelines and budgeting on time have been worse with devolution, (Soila, 2015). Therefore, in as much as there should be a genuine push towards increasing the budget, there should be a corresponding push for putting in place measures to ensure accountability of the same funds.

2.5 Theoretical literature

According to the essential medicines concept adopted by the WHO in 1977, essential medicines are those that meet the needs of a majority of the population. They are selected according to the prevailing needs such as geographical distribution of disease burden, safety, efficacy, efficiency, and relative cost effectiveness. They should be available so as to meet the requirements of the 6 rights of pharmaceutical commodity management. That is in the right quantity, right quality, in a timely manner, at the right place, to the intended patient (right patient) and at a cost that is affordable (right cost) (Bruno et al, 2015). By meeting these six rights, essential medicines are helpful in meeting one's health which is a basic need, hence creating a sense of satisfaction and enhancement of human life. This is supported by the Kenya constitution 2010 which provides that every person has the right to the highest attainable standards of health (Constitution of Kenya 2010.

2.5.1 Maslow's hierarchy of needs theory

Abraham Maslow developed this theory in 1943. It claims that a person's conduct esteem needs, and self-actualization needs are some of these needs. Health is one of the physiological needs, and in order to maintain good health, preventive and curative services should be given. The provision of these services is so reliant on the availability of drugs that a shortage of medicines makes providing high-quality health care almost impossible.

Physiological needs, according to Maslow, are the most critical and should be met first. Patients, health professionals, and drug manufacturers all benefit from the availability of vital drugs to protect and support human health, and it also helps to control diseases. To ensure that medications are available, systems, processes, practices, and individuals

must be coordinated to work together. The incentive to ensure that the necessary medicines are available in public health facilities is based on rational selection, quantification, and finally, utilization of medicines. It is also important to ensure that drugs are affordable by implementing policies that minimize costs. To ensure that drugs are still available, pharmaceutical supply chain management systems must be strengthened. This ensures that health—a basic physiological need—is met, allowing both patient and health-care provider motivation to flourish.

2.5.2 Systems Theory

Ludwig Bertalanffy, a biologist, proposed the Systems theory in 1940. It was later furthered by Ross Ashby (1964). It emphasizes that instead of reducing an entity to the properties of its individual elements, an emphasis should be focused on the arrangement and relations between the parts which connect them into a whole. Parts must be able to optimally function in order for the 'whole' to function and thus failure for the parts to work results in failure of the whole system.

In order to achieve an adequate availability of medicines, different players have to optimally work together, while complimenting each other. These include players in procurement, finance, management and those who manage medicines. This ensures that all the steps in the pharmaceutical supply chain that is quantification, selection, procurement, distribution, and use of medicines are done rationally hence ensuring availability of medicines.

2.6 Conceptual Framework

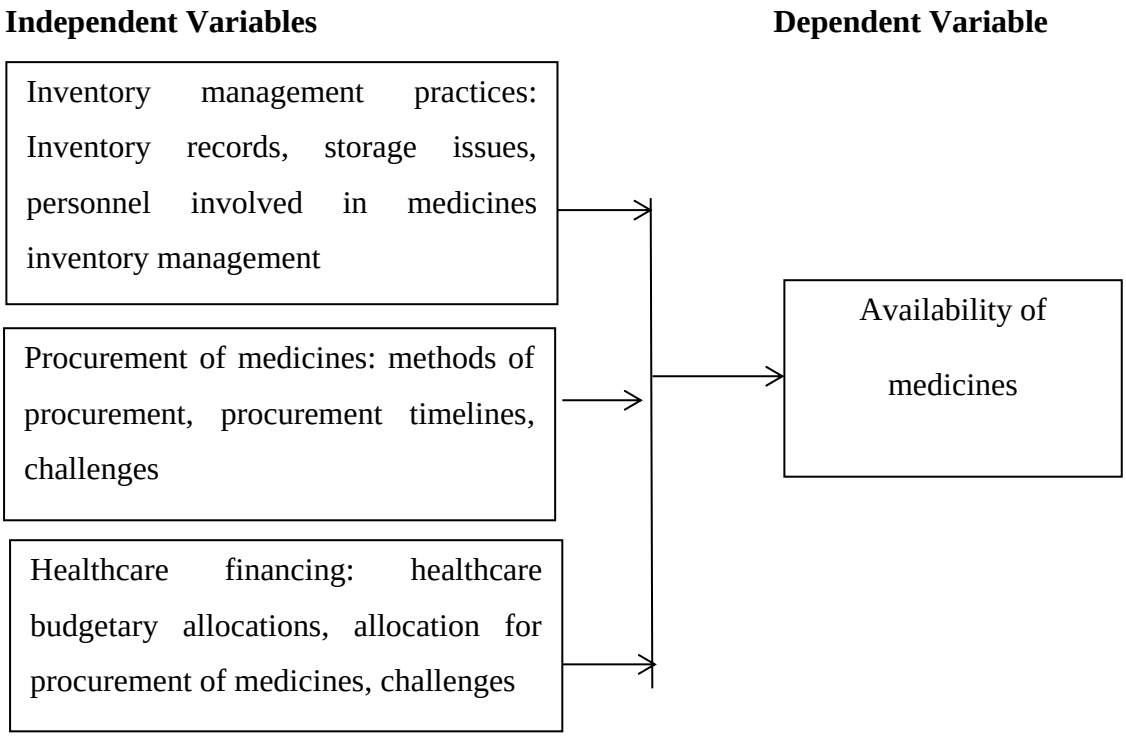

Figure 1: Conceptual Framework

2.7 Summary of literature review

Availability of medicines is an essential component of healthcare provision. However, in many settings particularly in developing countries, lack of medicines remains a great challenge. Many patients visit health facilities only to get none of their prescribed medications or just a few.

Availability of medicines is affected by several factors including procurement processes, inventory management practices, health care financing among others. When these factors are properly addressed, medicines will be available for all clients and thus an improved healthcare system.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter outlines details on how the research was conducted. It includes: study area, research design, target population, sampling techniques, research instruments, pretesting of study tools, data collection methods, data analysis and ethical considerations.

3.1 Research design

Descriptive cross sectional research design was used in this study. It took a mixed approach method (qualitative and quantitative). Qualitative data was collected through conducting of interviews with top health department's leadership with particular involvement in management of medicines. Quantitative data collection involved use of a questionnaire to the participants. An observational checklist was used on the day the researcher visited health facilities to collect information on availability of medicines under this study.

This design was used because it involves describing, recording, analyzing and reporting conditions that exist. It was important in obtaining key and precise information pertaining to the availability of medicines in Bungoma County and to draw conclusions on how health system determinants influence medicine's availability. It was also effective in analyzing issues and topics that could not be quantified. According to Owens (2002), cross sectional design is important when collecting data at one point in time from a sample. It was chosen since the researcher sought to collect information over a short period of time.

3.2 Location of the study

The study was conducted in Bungoma County (coordinates 0.4213°N to 1.1477°N along the latitude and 34.3627° E to 35.0677° E along the longitude). It is one of the forty-seven counties within the republic of Kenya that is approximately 3,032 km^2 in area. It is located in the former Western province and borders Uganda on the west. Other counties bordering Bungoma include Trans-Nzoia (Northeast), Kakamega (East & Southeast) and Busia (West and Southwest). It has nine units known as sub-counties: Bungoma Central, Bungoma South, Bungoma West, Kimilili, Bungoma North, Bumula, Mt. Elgon, Cheptais and Bungoma East. The sub-counties are divided further into forty-five county assembly wards, with the county headquarters based in Bungoma town, Kanduyi (Bungoma South) sub-county.

The Kenya National Population and Housing Census, 2019, established that the county had a total population of 1,670,570 being 812,146 males, 858,389 females and 35 intersex individuals (Kenya Population and Housing Census, 2019). The county has a total of 184 health facilities: 12 hospitals, 17 health centers, 102 dispensaries, and 52 clinics (Kenya Master Health Facility List, 2019). Among the hospitals, there are 9 public hospitals, one in each sub county. They were the focus of this study. The doctor to population ratio in the county is 6 per 100,000; nurse to population ratio is 32 per 100,000, while clinical officer to patient ratio is 11 per 100,000.

3.3 Target Population

The target population included the medical superintendents, health administrative officers, pharmacists and procurement personnel of public health facilities in Bungoma County, the head of county procurement department, the county pharmacist and the chief officer in charge of health and sanitation department.

3.4 Inclusion/ exclusion criteria

In this study, those individuals who are involved in management of medicines particularly with respect to procurement, health financing and inventory management were included. They were: the county pharmacist, medical superintendents, health administrative officers, pharmacists and procurement personnel of sub county hospitals, the head of county procurement department and the chief officer in charge of health and sanitation department in Bungoma County. These officers were expected to be present at their hospitals on the date of data collection for inclusion in the study.

On the other hand, those that are not involved in the activities above were excluded.

3.5 Sampling techniques

3.5.1 Sample size determination

The sample size was computed using G. power Priori power analysis as shown below:

Input:	Tail(s)	= One
	Effect size |ρ|	= 0.5
	α err prob	= 0.01
	Power (1-β err prob)	= 0.80
Output:	Non centrality parameter δ	= 3.3166248
	Critical t	= 2.4528242
	Df	= 31
	Total sample size	= 33
	Actual power	= 0.8006614

The priori analysis is efficient in controlling statistical power before a study is conducted (Hager, 2006). The sample n was calculated as function of power (80%), level of significance (0.01) and the population effect size taken as 0.5.

Power is the probability that the null hypothesis would be rejected correctly and according to Howell (2010), a frequently recognized power is .80. It is appropriate to

utilize a medium effect (0.5) in sample size calculation when making an estimate about the magnitude of the effect.

As calculated above, the total sample size was 33. However, considering a margin of error of 10%, 3 participants were added to achieve a sample of 36. This applied for the officers involved in management of medicines in the 9 public hospitals in Bungoma county thus the medical superintendent, health administrative officer, pharmacist and procurement officer.

Three other officers at the county level that is the county pharmacist, county procurement officer and chief officer in charge of health and sanitation were purposively sampled to participate in this study making the total sample to be thirty-nine (39).

3.5.2 Sampling methods and procedures

Census method of sampling was used. This method was considered since the entire study population was small. All the study population formed the sample. The medical superintendents, hospital health administrative officers, pharmacists and procurement officers in addition to the county pharmacist, county procurement officer and chief officer in charge of health and sanitation were visited in their respective hospitals and/or offices and data collected from them using appropriate data collection instruments.

All the nine sub county hospitals in Bungoma County were used in this study, leaving out health centers and dispensaries as there are proper and well-defined structures at hospitals as far as medicines management is concerned. Therefore, meeting the desired objectives of the study was possible by having hospitals only unlike if low level health facilities were also involved.

3.6 Sample population

The sample population comprised of medical superintendents, hospital health administrative officers, pharmacists and procurement officers in each of the nine sub county hospitals making a total of thirty-six (36) respondents. The county pharmacist, county procurement officer and chief officer in charge of health and sanitation were also sampled to participate in the study, hence making the total sample population to be thirty-nine (39).

3.7 Sample description

The sample population comprised of the medical superintendents (9) who are the in charges of hospitals and medical doctors by training and practice. The health administrative officers (9) support the medical superintendents in the running of hospitals and supervise administrative staff. Most of them are diploma graduates with a few being degree holders. Hospital pharmacists (9) being the health products and technologies day to day managers, directly handle medicine related issues. They are the medicines experts that this study sought to achieve its objectives. Lastly, procurement officers are a crucial group the researcher utilized so as to determine how procurement related aspects contribute to the availability of medicines.

3.8 Research Instruments

The main instruments of this research were semi-structured questionnaires, interview guides, and a checklist.

3.8.1 Semi Structured Questionnaire

Questionnaires in general, give detailed responses to complex research questions. They are relatively easy to use and cost effective, making them a popular data collection method. Questionnaires are most effective data collection instruments as they generate relatively objective data (Mugenda and Mugenda, 2003). In this study, questionnaires were the main data collection instrument. Questionnaires were used to collect information on how the selected health system determinants influence availability of medicines in Bungoma County. Demographic data, information on procurement processes, inventory management practices and healthcare financing was collected by this tool.

3.8.2 In-depth interview guides

In depth interview guides were another instrument for collection of data in this study. Interviews offer high quality of responses in addition to taking advantage of the presence of the interviewer. It combines questioning, cross-examination and probing techniques, making it a multi method tool of collecting data (Owens, 2002). In this study, in-depth interviews were used to collect data from the top management at the county level. The officers were visited in their offices and interviewed by the researcher using a guide that had questions touching on procurement process, inventory management practices and healthcare financing as they relate to availability of medicines.

3.8.3 Checklist

Finally, the study made use of a checklist so as to collect information concerning availability of medicines in hospitals. It consisted of a prepared list of items pertinent to the study. The checklist was adopted from the Bungoma County Essential Medicines Standard Order Form, Version 1 July 2016/17 for sub county hospitals. The checklist had all the essential medicines expected to be at hospitals. The absence or presence of an item was shown by marking '**yes**' or '**no**'. The checklist ensured that most aspects were considered in totality.

3.9 Validity and reliability

Mugenda and Mugenda (2003) noted that the accuracy of research findings depends on the data collection instruments in terms of their validity and reliability.

3.9.1 Validity of research instruments

When evaluating the validity of a research instrument, the degree to which the instrument measures what it is required to assess is significant (Kothari, 2004). Mugenda and Mugenda (2003) asserted that validity is the accuracy and meaningfulness of conclusions that are drawn from the outcomes of the investigation. In this research, validity of the research instruments was assured through pilot testing and consultation between the researcher and the University supervisors. Questionnaires were structured to ensure that they were focused, accurate and in consistency with research objectives. Content validity of the research instruments was done though elaborate consultations on structuring questionnaires with supervisors allocated by the University. On the other hand, external validity was done during the process of pilot testing.

Pilot testing was done in Kakamega County since it has similarities to Bungoma considering its geographic location. Two participants from Kakamega county referral hospital in Kakamega central sub county were used. According to Mugenda & Mugenda (1991), a successful pilot study uses 1% to 10% of the actual sample size.

The objective of pre testing of study tools was to determine the reliability of the tools for use in the main study. Piloting research instruments is necessary as it is a way of finalizing them and enables determination of their validity (Bell 2010). The researcher was satisfied with the results obtained from the pretesting exercise and no adjustments were made on the tools.

3.9.2 Reliability of research instruments

Reliability of research instruments can be described as the extent to which a research instrument produces similar results. This is supposed to be on different occasions but under similar conditions. It can also be said to be the degree of consistency with which a research instrument measures whatever it is meant to measure (Bell, 2010). Repeatability of research findings is the main concern of reliability.

Internal consistency of the questionnaires in this study was determined through a single test administration for the two sets of questionnaires administered in two health facilities piloted. The reliability coefficient was assessed using Cronbach's alpha (α) computed as follows:

$\alpha = k/k\text{-}1 \times [1 - \sum (S2)/\sum S2 \text{ sum}]$

Where:

α= Cronbach's alpha

k = Number of responses

∑ (S2) = Variance of individual items summed up

∑S2 sum = Variance of summed up scores

An instrument with a reliability coefficient of 0.7 is considered reliable (Fraenkel and Wallen 2000). The coefficient obtained in this case was 0.79

and was deemed satisfactorily reliable for the questionnaires to be used for data collection.

3.10 Data Collection Procedure

After administrative approval involving permission from post graduate School of Mount Kenya University, Institutional Research and Ethics Committee and permission from hospital administration, the study was accomplished in three phases:

Phase one involved administration of semi structured questionnaires to respondents: medical superintendent, hospital health administrative officer, pharmacist and procurement officer for sub county hospitals. Phase two comprised of conducting in depth interviews with key informants at the county level: county pharmacist, county procurement officer and chief officer in charge of health and sanitation. The sessions of the interviews were recorded as well as noted. The last phase was observation by use of a checklist so as to determine availability of medicines in hospitals. Those medicines that were available were marked 'Yes' while those that were stocked out were marked 'No'. Collected data was stored until the thesis was defended since this is an academic research project. During this period, the data was password protected to prevent unauthorized access.

3.11 Data analysis

The data collected was analyzed using quantitative methods. Quantitative data was cleaned to check for completeness, coded and entered into the computer statistical package (Statistical Package for Social Sciences (SPSS version 22.0). Entered data was cleaned to check for discrepancies and errors during entry process. Descriptive statistics were used to produce frequency distribution, percentages, means and standard deviation. Chi square was used to test for the association between variables. Logistic regression analysis was used to describe data and explain the relationship between the dependent variable and selected independent variables. Analysed quantitative data was then presented in tables.

Qualitative data generated was tape recorded, translated, transcribed and categorized into themes according to the objectives under research and reported in narrative form together presentations of quantitative nature.

3.12 Ethical considerations

A letter of introduction from Mount Kenya University, school of post graduate studies was obtained. A certificate of ethical approval from Mount Kenya University Ethics Review Committee and a research permit from The National Commission for Science, Technology & Innovation were also obtained by the researcher. Permission to conduct the study was obtained from respective hospitals. Prior to questionnaires administration, objectives of the study were explained to participants. Respondents were explained to that their participation in the study was voluntary and private information would be protected by strict standards of anonymity. There was informed consent for participants for them to choose to participate in the research or not.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSIONS

4.0 Introduction

This chapter details the research findings, analysis, presentation and discussions. Analysis was done on the contextual factors of the study which were described and presented in tables. The findings are hereby outlined as per the objectives of the study.

4.1 Demographic characteristics of the respondents

Table 1: Demographic characteristics of the respondents

Characteristic		Frequency	Percent (%)
Gender Male		26	81.3
Female		6	18.8
Cadre Medical officers		7	21.9
Pharmacists		8	25.0
Hospital administrative officers		13	40.6
Procurement officers		4	12.5
Work experience (years)	0-5	14	43.8
	6-10	3	9.4
	11-15	4	12.5
	16-20	5	15.6
	21-25	3	9.4
	Above 25	3	9.4
Total		**32**	**100**

Source: Researcher (2018)

A total of thirty-six (36) questionnaires were prepared, however, only thirty-two (32) respondents could be reached, signifying a response rate of 88.89%. According to Babbie (2004), a questionnaire response rate of between 80% and 90% is adequate for a descriptive research design work. Out of these, 26 (81.2%) were male while 6 (18.8%) were female. This gender distribution was in contravention to a study by Akacho

(2014) that found out that a majority of individuals working in health facilities are female.

The distribution of the 32 respondents by cadre is also shown in the table above. The largest number of them was hospital administrative officers constituting, 40.6% while the least number was that of procurement officers who comprised of 12.5%. Pharmacists exceeded medical officers by only one respondent. As it regards the respondents' work experiences, a majority of them had worked for a period of less than five years. They were 43.8% of all respondents. The least percentage had work experiences of between 6 to 10 years, 21 to 25 years and above 25 years, all contributing to 9.4% each.

4.2 Influence of procurement process on availability of medicines in public health facilities in Bungoma County

4.2.1 Adherence to procurement procedures

A very large number of respondents (81.2%) reiterated that procurement processes were followed as compared to a minority (18.8%) who indicated that in some cases, laid down procurement procedures were not followed. This is shown in table 2 below.

This clearly shows that most health care workers are keen to adhere to the laid down regulations according to the Public Procurement and Disposal Act. The few who indicated that they did not adhere to the procurement procedures probably did so in emergency situations where medicines had to be sourced within the shortest time possible in order to save lives.

Table 2: Adherence to procurement procedures by respondents

Adherence to procurement process	Frequency	Percent
Yes	26	81.3
No	6	18.8
Total	32	100.0

Source: Researcher (2018)

4.2.2 Relationship between cadre of respondents and work experience and adherence to procurement procedures

Among those who said procurement procedures were followed, a majority (38.5%) were Hospital administrative officers. All procurement officers noted that procurement processes were followed while out of the 8 pharmacists, only 12.5% of them indicated that procurement procedures were not followed. Of the medical officers, 71.4% responded that appropriate procurement procedures were followed with 28.6% of them saying that procurement procedures were not followed. There was no significant relationship between adherence of procurement procedures and the cadre of the health professional involved (χ^2 =2.230: p= 0.534).

It can therefore be said that the knowledge of procurement procedures and processes is across all the cadres of health professionals involved in management of medicines. All procurement officers reported adherence to procurement processes since they are the single most cadre that have training and expertise in procurement matters. A majority of the other cadres also said that there is adherence to procurement processes since in their nature of work, they are exposed to various procurement matters. The few who reported not adhering to procurement processes probably were not aware of the said processes or did so in extreme circumstances, for instance, emergency situations.

All respondents who had work experiences of above 21 years had adherence to procurement processes. These formed 23.1% of all respondents who said procurement procedures were followed. Of those with non-adherence to procurement procedures, 66.7% had a work experience of less than five years. 38.5% of those who reported adherence to procurement procedures had work experiences of between 6 and 20 years with just two in this category indicating non adherence. None of the respondents with work experiences of between 11-15 years reported non adherence to procurement procedures. Application of Chi- square showed a significant relationship between adherence to procurement procedures and the work experience of the health professional involved ($\chi^2 = 11.24$; $p = 0.003$).

This information is represented in table 3 below:

Table 3: Relationship between cadre and work experience of respondents and adherence to procurement procedures

Characteristic	**Adherence to procurement procedures**		**Total**	Test
	Yes	**No**		
Cadre				
Medical officers	5	2	7	
Pharmacists	7	1	8	
Health administrative officers	10	3	13	χ^2 =2.230:P= 0.534
Procurement officers	4	0	4	
Work experience (years)				
0-5	10	4	14	
6-10	2	1	3	χ^2=11.24; P= 0.003
11-15	4	0	4	
16-20	4	1	5	
21-25	3	0	3	
Above 25	3	0	3	
Total			**32**	

Source: Researcher (2018)

It can be deduced from these findings that work experience of health workers involved in management of medicines is a determinant of adherence to procurement procedures. The higher the work experience, the greater the adherence to procurement processes. All respondents with a work experience of more than 21 years for example, adhered to procurement processes. On the other hand, those with less than 5 years of work

experience formed a majority of those who reported non adherence to procurement processes. This is because those who had worked longer were experienced in matters procurement and probably understand the consequences of not adhering to the laid down procurement processes.

4.2.3 Relationship between gender of respondents and adherence to procurement procedures

84.6% of male respondents adhered to laid down procurement procedures while only 15.4% did not. On the other side, 66.7% of females reported adherence to procurement procedures as compared to 33.3% who did not. There was significant relationship between adherence of procurement procedures and the gender of the health professional involved (Odds ratio=OR=2.75).

A majority of male respondents indicated adherence to procurement procedures as compared to their female counterparts. This could be due to the fact that males are said to be authoritative and this probably is why they adhered to the procurement processes. In most cases, a person in authority will strive to do all it takes so as not to break the laid down rules, regulations and procedures.

Table 4: Gender of respondents and adherence to procurement procedures

		Are the procurement procedures adhered to?		Total
		Yes	No	
Gender of the respondents	Male	22	4	26
	Female	4	2	6
Total		26	6	32

Test: Odds ratio=OR=2.75.

Source: Researcher (2018)

4.2.4 Relationship between adherence to procurement procedures and discrepancies between actual quantities received and quantities indicated on delivery notes

Of all the respondents, 53.1% reported incidences of discrepancies between actual quantities received and that indicated on delivery notes. 46.9% of respondents had no such discrepancy. A majority (57.7%) of those who had adherence to procurement procedures had incidences of the said discrepancies while only 42.3% of them did not have the discrepancy. A significant number (66.7%) of those with non- adherence to procurement procedures did not have discrepancies between actual quantities received and that indicated on delivery notes.

Discrepancies between quantities actually received and quantities indicated on delivery notes may arise as an error on the part of the supplier. However, it requires that the recipient is very keen so as to notice such discrepancies.

In general, the officer receiving medicines should accurately countercheck to confirm that quantities received are the same as those appearing on delivery notes before making a decision to receive the supplies. If there are any discrepancies, then the

consignment should be rejected as a whole and communication made to the supplier. More than half of respondents indicated that they had had these discrepancies. This shows out possible weaknesses in the public health sector supply system. A point to note is that the consignments were just received regardless of the said discrepancies most probably out of desperation on the part of the receiving officers as in most of the cases; supplies are made when the health facility is completely out stocked. A majority of those who reported the discrepancies had adherence to procurement processes; an evidence that they were very keen to identify the discrepancies as a result of them observing procurement processes.

Table 5: Adherence to procurement procedures and incidences of discrepancies between received quantities and qualities on delivery notes

		Incidences of discrepancies between received quantities and qualities on delivery notes		Total
Are the procurement		Yes	No	
procedures adhered	Yes	15	11	26
to?	No	2	4	6
Total		17	15	32

$\chi 2 = 6.28$; $P = 0.025$

Source: Researcher (2018)

There was significant relationship between adherence to procurement procedures and the incidences of discrepancies between received quantities and quantities on the delivery notes ($\chi 2 = 6.28$; $P = 0.025$).

4.2.5 Procedures used to procure medicines

Table 6: Procedures used to procure medicines

	Frequency	Percent
Open tendering	1	3.1
Request for quotation	3	9.4
Direct tendering	28	87.5
Total	32	100.0

Source: Researcher (2018)

An outstanding majority of respondents (28 out of 32) said that their respective health facilities use direct tendering as a method of procuring medicines. This translates to 87.5% of all respondents. Open tendering was said to be in use by only one respondent (3.1%) while request for quotation was by three respondents (9.4%).

4.2.6 Officers involved in procurement of medicines

Findings on officers involved in procurement of medicines from an interview revealed as follows:

'Those involved in the procurement process are health facilities in charges-nurses or clinical officers for rural health facilities or pharmaceutical personnel for hospitals who generate orders. The county pharmacist, county procurement officer, chief officer health & sanitation are involved in sending orders to suppliers and subsequently making payments" (Interview, senior county personnel, 2018).

This is because these officers have the necessary technical knowhow to undertake procurement roles and responsibilities. The nature of their work also dictates that they are actively involved in procurement of medicines.

4.2.7 Challenges in relation to medicines procurement

Main challenges in relation to medicines procurement and how can they be addressed were as highlighted in an interview with a senior county staff as follows:

"Inadequate funding for medicines procurement, inadequate procurement personnel and long procurement process are the main challenges we face. They can be addressed by increasing medicines procurement funding and prioritization of medicines procurement, hiring more procurement officers particularly in sub county hospitals and have more procurement staff to handle these processes to have it shorter" (Interview, senior county staff, 2018.)

The above challenges were sighted as being the main ones relating to procurement of medicines. They are in agreement with the findings by Mwathi and Osuga (2014) as it relates to funding and Economic and Social Rights Center- Hakijamii (2017) as it relates to the length of the procurement process respectively.

4.3 Influence of inventory management practices on availability of medicines in Bungoma County

4.3.1 Major suppliers of medicines

Table 7: Major suppliers of medicine

Supplier	Frequency	Percent
Local pharmacies	2	6.3
KEMSA	30	93.7
Total	32	100.0

Source: Researcher (2018)

The Kenya Medical Supplies Authority (KEMSA) was cited as the main supplier of medicines by 93.7% of respondents. This agrees a study by Muirui & Mugambi (2017)

which cited KEMSA as a major supplier of essential medicines. On the other hand, only 6.3% of respondents talked of local pharmacies as their main suppliers of medicines. These suppliers supply medicines direct to the health facilities. The delivery is done on time as indicated by 96.9% of respondents. Delivery outside the specified time was only reported by 3.1% of respondents. This is illustrated in table 8 below:

Table 8: Timely delivery of medicines to health facilities

	Frequency	Percent
Yes	31	96.9
No	1	3.1
Total	32	100.0

Source: Researcher (2018)

4.3.2 Security status of the medicines store

Table 9: Security status of the store

	Frequency	Percent
Good	10	31.2
Average	22	68.8
Total	32	100.0

Source: Researcher (2018)

A majority (68.8%) of respondents rated the security status of their medicines' stores as average while 31.2% rated it as good. It can be concluded that the medicines' stores in the hospitals in Bungoma County are of satisfactory security status. This is important as it helps mitigate theft of medicines, preventing pilferage.

4.3.3 Factors considered in selecting suppliers of medicines- proximity to health facility.

Table 10: Proximity to health facility and supplier selection

Rating of proximity to health facility as a factor in supplier selection	Frequency	Percent
Extremely important	8	25.0
Important	15	46.9
Didn't know	9	28.1
Total	32	100.0

Source: Researcher (2018)

Proximity of the supplier to the health facility was rated as important by 46.9% of respondents. 25% respondents rated this as extremely important while 28.1% were not in the know how.

Other factors considered in supplier choice included pre-qualification by the county government, past history of the supplier, Suppliers' prices for medicines.

4.3.4 Reasons for expiry of medicines

Table 11: Reasons for expiries

Reasons for expiry	Frequency	Percent
Reduced utilization of medicines	27	84.4
Items received as short expiry items	5	15.6
Total	32	100.0

Source: Researcher (2018)

84.4% of respondents cited reduced utilization of medicines as their main reason for having the said medicines expire. Only a few (15.6%) talked of items being received as short dated items as their reason for expiries. Reduced utilization of medicines in the visited health facilities was mainly due to the industrial unrest by health workers that had just been concluded by the time of collecting data for this research. This had lasted almost seven (7) months, making patients to go to private and mission health facilities for treatment. The subsequent result was that most medicines expired since they were not being utilized within this period. For a few items which were said to have been received as short expiry, most of them had been received on demand by the health facilities since they thought they would utilize them before their expiry date.

4.3.5 Status of various inventory management parameters

Table 12: Status of various inventory management parameters

Inventory management characteristic	**Response**		**Total**
	Yes	**No**	
Presence of standard operating procedures on pharmaceutical stores management	23	9	32
Availability of records on consumption and stock status	25	7	32
Availability of medicine management system in the facility	29	3	32
Availability of standard treatment guidelines	21	11	32
Reported cases of medicines expiry	30	2	32
Health facility access to Kenya essential medicine list	22	10	32
Health facility have designated store for medicine	17	15	32

Source: Researcher (2018)

Table 12 above outlines various aspects of inventory management, stating if they were available or not.

Standard operating procedures (SOPs) on pharmaceutical management were reported to be available by 71.9% of respondents. Only 78.1% of respondents had records relating to consumption of medicines and stock status as compared to 21.9% who did not. A medicines management system (manual or electronic) was reported to be in place by 90.6% of respondents while only 9.4% said such a system was not in place. Regarding treatment guidelines, about a 34.4% of the respondents did not have them with an almost similar number 31.3% not having access to the Kenya essential medicines list. 53.1% of respondents reported that their health facilities had designated stores for medicines while 46.9% didn't have. On the same note, cases of expiry of medicines were reported by 6.3% of respondents while 93.7% recorded no such cases.

Most of the respondents indicated that their health facilities were in possession of important inventory management tools such as standard operating procedures, treatment guidelines, inventory management systems and essential medicines lists. However, it was noted that most of these tools were outdated because they used to be supplied by the national government's ministry of health pre devolution. The county is yet to take up this role and supply the said tools. This reason also partly explains why a few health facilities lacked them.

On the issue of having a designated medicines store, almost half of the respondents indicated that they did not have designated stores. This is because most of them were only recently upgraded to sub county hospital status from the older health center status. They are therefore yet to develop or designate storage areas for medicines.

4.3.6 Methods followed when issuing medicine from the store

First Expiry First-Out (FEFO) method of issuing medicines from stores was the main method reported by a majority 62.5% of respondents while only 37.5% were in support of First in First out (FIFO). This was in tandem with findings by Shadrack (2015) that the method by which essential drugs were approved and issued was mostly FEFO. FEFO method is a preferred inventory control method as it allows for issuance of those medicines that are near to be expired, sparing those with longer expiry dates. This way, losses and wastage through expiry of medicines is prevented.

These findings are as shown in table 13 below.

Table 13: Methods/ Procedures followed when issuing medicine from the store

Method of issuing medicines	Frequency	Percent
First In First Out	12	37.5
First Expiry First Out	20	62.5
Total	32	100.0

Source: Researcher (2018)

4.3.7 Relationship between having a store in the health facility and methods used when issuing medicines

Table 14: Having a designated medicines store in the facility and methods/ procedures used when issuing medicines

		Does the facility have a designated store for medicine?		Total
		Yes	No	
Methods/Procedures followed when issuing medicine from the store	FIFO	6	6	12
	FEFO	11	9	20
Total		17	15	32

Cramer's V=0.232; P= 0.190

Source: Researcher (2018)

50% of respondents who used FIFO method to issue medicines had designated medicines stores while the other half did not have designated stores for medicines. Among those who used FEFO, 55% had a designated store while 45% did not. On the other hand, among respondents who had designated medicines stores, 35.3% reported using FIFO while 64.7% used FEFO. In the category of those without designated stores, 40% of them used FIFO and the remaining 60% used FEFO. According to Cramer's V test, there was no significant relationship between the facility having a designated store for medicines and the method used to issue medicines (Cramer's V=0.232; P= 0.190).

Having a store or a designated store specifically for medicines is an important aspect of pharmaceutical inventory management. From these findings, a significant number of respondents without designated stores were for FIFO method which is not preferred as it has high chances of causing expiry of stock. Probably, they chose this method as they were unable to properly arrange their medicines as a result of not having stores.

4.3.8 Relationship between having a designated store and reasons for expiry of medicines

Out of the respondents who cited reduced utilization of medicines as a reason for expiry of medicines, 51.9% did not have a designated store while an almost equal number of 48.1% had designated stores. On the other hand, only 20% of respondents who said they received short dated medicines hence their expiry, did not have a designated store. The remaining 80% of respondents had designated stores.

Lack of designated stores has a direct relationship with expiry of medicines. This is because it is likely to lead to underutilization as health workers may not have an idea

where the said medicines were stored. This may explain why most of those without stores indicated that they had expiries due to underutilization.

Table 15: Health facility having a designated store and reasons for expiry of medicines

		Does the facility have a designated store for medicine?		Total
		Yes	No	
Reasons for expiries	Reduced utilization of medicines	13	14	27
	Items received as short expiry items	4	1	5
Total		17	15	32

Source: Researcher (2018)

4.3.9 Relationship between cadre of health care personnel and the frequency of placing orders

78.1% of the respondents pointed out that the frequency of ordering was irregular, 15.6% talked of quarterly while 6.3% said ordering was on monthly basis. Of those who said ordering was irregular, a majority (40%) were health administrative officers with procurement officers being the least (12%). Medical officers comprised 21.9% while pharmacists were 15.6% of those respondents who said ordering was irregularly done. All the 7 medical officers indicated that ordering was irregular. Among those who said ordering was monthly, 50% were pharmacists while another 50% were health administrative officers. This compares with the category of those who said ordering was quarterly in which case, 40% of those who supported this were pharmacists, 40% were health administrative officers and only 25% were procurement officers. This is as shown in table 16 below.

Table 16: Cadre of the health personnel and Frequency of ordering of medicine

		Frequency of ordering			Total
		Monthly	Quarterly	Irregularly	
Cadre	Medical Officers	0	0	7	7
	Pharmacists	1	2	5	8
	Hospital administrative officers	1	2	10	13
	Procurement officers	0	1	3	4
Total		2	5	25	32

Test ANOVA=F= 12.00; P= 0.035

Source: Researcher (2018)

According to ANOVA test, as indicated above, there was no significant difference between the means of the frequency of ordering medicines and the cadre of the health professionals involved.

From these findings, it is evident that the frequency of ordering for medicines is irregular. For instance, at the time of data collection, the last time an order was ever made was almost eight months. This irregularity is however, only experienced in this post devolution era. Before devolution of health services to the county level, health facilities could order medicines from KEMSA on quarterly basis using a standard order form designed by KEMSA (The World Bank, 2009).

4.3.10 Work experience of respondents and the frequency of placing orders

Table 17: Work experience of respondents and the frequency of ordering

		Frequency of ordering			Total
		Monthly	Quarterly	Irregularly	
	0-5	2	3	9	14
	6-10	0	1	2	3
Work	11-15	0	0	4	4
Experience(years)	16-20	0	0	5	5
	21-25	0	1	2	3
	Above 25	0	0	3	3
Total		2	5	25	32

Source: Researcher (2018)

Respondents who had the least work experience of less than five years formed a majority (36%) of those who indicated that ordering frequency was irregular with the least being those with work experience of between 6 to 10 years and 21 to 25 years who were 8% respectively of all who said ordering was irregular. This could be attributed to the fact that those with little work experiences are not in a good position to influence policy directions that could allow for a regular ordering cycle. Considering this, the management may not have proper guidance from its officers on the ground hence the irregular ordering cycle. All respondents (3) with more than 25 years of work experience indicated that ordering was done irregularly. Monthly ordering was only reported by 6.25% of respondents who had work experiences of less than five years. 60% of those who reported that ordering was quarterly had work experience of less than five years. The remaining 40% was shared equally between those with work experiences of between 6 to 10years and those between 21 and 25 years. There was no significant difference between the means of the frequency of ordering medicines and the work experiences of the heath professional involved (F= 2.00; P= 0.035).

4.3.11 Availability of medicines

Medicine's availability situation in the county was reported as poor considering there had been no procurement for the current financial year 2017/2018.

Table 18: Availability of medicines – number of medicines available, number of medicines out of stock and stock out days

Health facility	Number of medicines available on day of visit out of **114**	Per cent availability (%)	Number of medicines not available on day of visit out of **114**	Per cent unavailability (%)	Average out of stock days	Mode of out-of-stock days
1	73	64.04	41	35.96	52.90	90
2	70	61.40	44	38.60	55.02	90
3	79	69.30	35	30.70	39.90	60
4	90	78.95	24	21.05	35.00	90
5	73	64.04	41	35.96	56.00	90
6	60	52.63	54	47.37	54.60	90
7	83	72.81	31	27.19	61.80	90
8	67	58.77	47	41.22	57.50	90
9	55	48.25	59	51.75	49.00	60

Source: Researcher (2018)

Average number of medicines available in the whole county was 72.22 (63.35%)

Average number of medicines that were out of stock was 41.78 (36.65%)

Average out of stock days for the county was 51.30

The facility that was well stocked on the day of visit had 78.95% availability of medicines while the least availability was reported at 48.25%. On the same note, 88.9% of visited health facilities had percent availability of above 50% while 11.1% of them

had an availability of less than 50%. An interview with a senior county staff deduced that the situation on availability of medicines was fair thus:

"I can describe the current medicine availability situation to be fair considering that most of our health facilities have more than half of the medicines required" (Interview, senior county staff, 2018).

On average, the availability of medicines in the county was lower than that reported in other studies. On the same note, the average out of stock days were higher compared to those reported in several other studies (Tumwine Y, *et al*, 2010; Bruno O, *et al*, 2015).

4.3.12 Officers involved in management of medicines

Information on officers involved in availability of medicines as obtained from an interview with a senior county staff was as follows:

"The county only has about forty pharmaceutical personnel which an inadequate number, considering that there are so many health facilities" (Interview, senior county staff, 2018).

From this finding, most of the health facilities operate without pharmaceutical staff, a fact which contravenes the legal provisions for the operation of pharmacy business. The county needs to urgently consider hiring more pharmacists and pharmaceutical technologists to curb this problem.

4.3.13 Challenges in relation to medicines inventory management.

The following were identified as main challenges in relation to inventory management as per the interview with a senior county staff:

"As a county, we lack of a central county store for medicines and a reliable inventory management system to manage and track medicines. We need to construct a common

store and Source for an inventory management system that is standardized across the county for medicines management. (Interview, senior county staff, 2018).

Having a designated central store for the county will ensure that medicines are stocked there in bulk and any time a health facility runs short of a given medicine, a request to the central store can be made. Central Medical Stores in developing countries like Kenya are usually the backbone of public health procurement and distribution models (USAID- Deliver project, 2013). Additionally, a reliable inventory management system will be useful in tracking commodities and forecasting since information on stock status and consumption will available in real time.

4.4 Influence of health care financing and availability of medicines in Bungoma County

4.4.1 Estimated budgetary allocation

An interview with a senior county staff revealed the following concerning budgetary allocation to the health docket:

"Our estimated budgetary allocation for the health department was about Kshs 2.6 Billion which is about 20 percent of the entire county budget. This is inadequate considering over 90% of it goes towards payment of salaries and other recurrent expenses" (interview, senior county staff, 2018).

This is higher as compared to the requirement of the Abuja declaration (2001). The Abuja declaration set the budget allocation to health at 15% of the entire budget. Surprisingly, the allocation towards procurement of medicines was too little as per the interview statement below:

"…only about Kshs 120 million is allocated for procurement of medicines." (Interview, senior county staff, 2018).

This is way too low (4.6%) compared to what the national government used to allocate that is 36.64 % of the total health expenditure (MOMS, 2010).

4.4.2 Estimated budget deficit

Table 19: Estimated budget deficit

Percentage budget deficit (%)	Frequency	Percent
0-10	0	0
11-20	0	0
20-30	4	12.5
31-40	17	53.1
41-50	10	31.3
51-60	1	3.1
Total	32	100.0

Source: Researcher (2018)

The highest percentage budget deficit for the allocation made towards purchase of medicines was between 31 to 40 per cent which was reported by 53.1% of the respondents while the least was between 51 and 60 percent having been reported by 3.1% of respondents. A significant number of respondents (31.3%) indicated that their estimated budgetary deficit was between 41-50%. None of the respondents had a budgetary deficiency of less than 20%. This clearly shows that all health facilities have deficits in as far as budgetary allocations are done towards purchase of medicines. It therefore means that availability of medicines is affected because of these deficiencies.

The low allocation for purchase of medicines is mainly due to the fact that there are so many competing demands which have to be met in a health care system apart from procuring medicines. The result is that very little funds are allocated to medicines as supported by a study done by Lucy Mecca which revealed that Webuye County referral

hospital allocated an average of 9.12% for medicines out of their Facility Improvement Funds (FIF) in 2012/2013 financial year (Lucy WM, 2014).

4.4.3 Relationship between inadequate funding as a reason for stock outs and allocation of funds as per quantification needs as a solution to this problem

A majority (85.7%) of respondents who strongly agreed that inadequate funding was an issue leading to stock outs of medicines in their respective health facilities cited that it was extremely important to have allocation of funds for procurement of medicines based on quantification requirements. This represents 52.2% of respondents who strongly agreed with the fact that allocation of funds be made as per quantification requirements. Another 66.7% of respondents who agreed that inadequate funding was an issue leading to stock outs felt that it was extremely important to have allocation of funds for procurement of medicines based on quantification requirements. Only a small percentage of respondents (3.1%) reported that it was extremely not important to have procurement funds allocated as per quantification needs although at the same time, agreed that inadequate funding was an issue contributing to stock outs There was therefore a strong relationship between inadequate funding and allocating funds for procuring medicines based on quantification ($\chi 2= 11.23$; $P= 0.006$).

The results of the study by Mwathi and Osuga compare favorably to this study as it indicated that there was a strong association between funding and the availability of medications. It was the aspect least mentioned (but which is nonetheless crucial to unavailability of important drugs in public hospitals) that caused inadequate funding (Mwathi and Osuga, 2014).

Table 20: Inadequate funding as a reason for stock outs and allocation of funds for medicine as per quantification requirements as a remedy

		Allocation of funds for medicines procurement as per quantification requirements			Total
		Extremely not important	Important	Extremely important	
Inadequate funding	Strongly Disagree	0	1	0	1
	Don't know	0	1	1	2
	Agree	1	4	10	15
	Strongly agree	0	2	12	14
Total		1	8	23	32

Chi square 11.23; p=0.006

Source: Researcher (2018)

4.4.4 Inadequate funding as a reason for stock outs of medicines

Table 21: Inadequate funding and stock outs of medicines

	Frequency	Percent
Strongly Disagree	1	3.1
Don't know	2	6.3
Agree	15	46.9
Strongly agree	14	43.8
Total	32	100.0

Source: Researcher (2018)

Generally, most respondents agreed that inadequate funding was the main issue leading to stock out of medicines in their health facilities. Out of all respondents, 43.8% strongly agreed to this statement while 46.9% plainly agreed. Only 3.1% strongly disagreed while 6.3% didn't know. Funding is very important in acquiring any property and therefore lack of it means acquisition of the said property will not be possible. These findings are similar to other studies which have pointed out that inadequate funding among other factors such as expiry, high prices and pilferage affects accessibility to medicines (MoH, 2009; Elliot, 2008).

4.4.5 General concerns relating to healthcare financing and medicines financing in particular and how they can be addressed

Concerns relating to healthcare financing were deduced from an interview as follows:

"Inadequate allocation of funds for procurement of medicines and lack of rational budgeting are key issues we face as far as healthcare financing is concerned. There is need to allocate funds according to our medicines quantification needs and prioritize health docket when it comes to budgeting" (Interview, senior county staff, 2018)

4.5 Logistic regression analysis - effect of demographic characteristics, cadre, work experience on availability of medicine (Backward Stepwise Method).

The impact of inventory management on drug availability was evaluated using logistic regression techniques (backward elimination procedure) with categorical values of the variables analyzed as the dependent variable, and availability of medicines as the independent variable. In the model, the following two levels of variables (0,1) were used: working experience (0-5 years, 6-10 years, 16-20 years, 21-25 years and above 25 years), gender (Male, Female), cadre (pharmacist, medical superintendent, health administrative officer, procurement officer, following of procurement process (Yes,

No) and adherence to procurement procedures (Yes, No, Other). Cadre of respondents was not statistically significant (OR 2.58, Cl 1.46 - 3.66 P= 0.42). The results at the final elimination step of the regression process are summarized in table 25 below. Significantly greater influence was found in officers with longer work experience (OR=2.58, 95% Cl, 1.46 to 3.66). The work experience of respondents in this study was skewed towards 0-5 years. This means that these officers had only worked for a shorter period of time and were newly employed. When assessing the experience gained in a certain field, the number of years worked should be put into consideration (Laaria, M, 2013). Those who have worked for a shorter time will be expected not to have the same competencies as those who have worked longer. In addition, there was some evidence that male officers better understood inventory management practices than females and influenced the availability of medicines (OR=0.65, 95% Cl, 0.49 to 0.86), However, when only those officers who said they follow procurement procedures were included in the equation, the effects of inventory management practices on the availability of medicines were less striking and inconsistent. The influence of budgetary allocation was significant where subjects who said that budgetary allocation influence availability medicine were included (OR=2.65, 95% Cl, 0.737, 3.123), whereas the adherence to procurement procedure seemed to have a greater influence on the availability of medicine (OR=4.194, P=0.002).

The Table below shows the analysis of the effect of demographic characteristics, cadre, and work experience on availability of medicine (Backward Stepwise Method).

Table 22: Logistic regression results: cadre, and work experience on availability of medicine

Characteristic	coefficient	SE **of β**	**P-value**	O R (**95% CI)**
Gender	-1.027	0.179	.053	.65, (0.49 - 0.86)
Cadre	.169	0.4	.42	2.58, (1.46 -3.66)
Work experience	-.430	0.143	.002	3.4, (1.37-7.45)
Procurement process	0.464	1.228	.001	2.65, (.0737- 3.12)
Budgetary allocation	-1.193	0.528	0.001	2.65,(0.737-1.123)
Adherence to Procurement procedures	2.072	-0.787	0.002	4.19, 0.94-5.437

Source: Researcher (2018)

4.6 Logistic regression analysis indicating association between demographic characteristics, budget allocation according to quantification needs.

Budgetary allocation according to quantification needs, having a revolving fund, rational budgeting, training on financial management and decentralization of funds to sub counties were analyzed and showed a significant and independent association with availability of medicines (OR= 4.2; 95% CI=2.3, 6.8). Having a revolving fund was associated with increased availability of medicines in county health facilities (OR=5.5; CI=2.3, 8.6). This can be explained by the fact that revolving funds ensures that funds for procurement of medicines are always available hence having no stock outs. This finding is in agreement with a study done in western Kenya on revolving fund pharmacies backing up ministry of health's supply chains. The study revealed an increase in availability of medicines by almost 100 percent (Manji, I *et al*., 2016). Budget allocation as per quantification needs (OR=3.9; cl=2.3, 6.6), training on

financial management (OR=1.6; CI=0.67, 2.62), decentralization of funds for medicines' procurement to sub counties (OR=3.5; CI=2.9, 4.6) were also associated with increased availability of medicines; however rational budgeting (OR=0.2; CI =0.8 - 1.4) was not significantly associated with availability of medicines. This could be because a budget done rationally does not necessarily imply that it is adequate. These are as in the table below:

Table 23: Logistic regression analysis indicating association between demographic characteristics, budget allocation according to quantification needs.

Characteristics	**Adjusted Odds Ratio for financial Management**			
	P value	**AOR**	**95% confidence**	
Financial management practices	0.001	4.2	2.3	6.3
Adjusted odds ratio by characteristics controlled				
Gender: Male vs. female	0.02	2.1	0.5	3.8
Cadre: Medical superintendent, Pharmacist, Others	0.00	2.9	0.9	4.9
Work experience: 0-5, etc.	0.043	1.6	0.3	3.6
Budget allocation as per quantification	<0.001	3.9	2.3	6.2
Revolving Fund;	0.025	5.5	2.3	8.6
Rational budgeting:	0.45	0.2	-0.8	1.4
Training on financial management	0.031	1.6	0.67	2.62
Decentralization of Funds	0.007	3.5	2.9	4.6

Source: Researcher (2018)

4.7 Discussions

4.7.1 Demographic characteristics of respondents

The questionnaire response rate was 88.89%. This is adequate for this study design according to Babbie (2004), who reiterated that a questionnaire response rate of between 80% and 90% is adequate for a descriptive research design work. Out of these, 81.2% were male while 18.8% were female. This gender distribution differs sharply with what Akacho (2014) found out that a majority of health workers are female. Perhaps a more elaborate explanation is that the study did not involve nurses as respondents, who are majorly female owing to the tender care associated with nursing.

A majority of the respondent were health administrative officers while the least number was for procurement officers. Pharmacists only exceeded medical officers by one. The high number of health administrative officers could be due to the fact that they are involved in the day-to-day administrative activities of hospitals, making their presence to be required throughout. On the other hand, medical officers and pharmacists offer highly specialized care and thus many could not be reached on the day and time the researcher visited their hospitals as they could have been possibly attending to patients. Lastly, procurement officers were only four since not all hospitals in the county are procurement entities. The officers were therefore deployed to just a few hospitals which are also procurement entities as per the county's procurement regulations.

The work experience of respondents was skewed towards 0-5 years. These officers had only worked for a shorter period of time and were newly employed. This is attributed to the trend that exists across the health sector that many heath care workers stick to employment in public health facilities in their initial years of working before shifting to non-governmental organizations and private practice. When assessing the experience gained in a certain field, the number of years worked should be put into consideration

(Laaria, 2013). Those who have worked for a shorter time will be expected not to have the same competencies as those who have worked longer.

4.7.2 Influence of procurement process on availability of medicines in Bungoma County.

The process of acquiring goods and services in accordance with applicable laws and regulations is referred to as procurement. Procurement may be undertaken locally, nationally, and internationally among public, private, national, international, and local players. (Antony & Josphat, 2016).

81% of respondents indicated that procurement processes were followed while 19% indicated that in some cases, laid down procurement procedures were not followed. This shows that most health care workers are keen to adhere to the laid down regulations according to the Public Procurement and Disposal Act. Those who said that they did not adhere to the procurement procedures probably did so in emergency situations where medicines have to be obtained within the shortest time possible. According to the Public Procurement and Oversight Authority (PPOA), a procurement process may take up to 100 days (PPOA, 2010). This is an unacceptably long period especially in health care service delivery where any delay could lead to worse out comes including death.

39% of those who indicated adherence to procurement procedures were health administrative officers while all procurement officers adhered to the laid down procedures. This is explained by the fact that health administrative officers are the in charges of administrative staff including procurement officers and thus approve procurement requests and other procurement processes. The procurement officers on

the other hand indicated that they adhere to procurement procedures as procurement is their area of specialty by training and practice.

Direct procurement method was cited by about 88% of respondents. This is contrary to a study which indicates that competitive procurement is recommended. Competitive procurement offers a chance to have quality medicines supplied at the lowest possible price (Food and Health Bureau, 2013). According to section 29 of the Public Procurement &Disposal Act, 2005, open tendering is the preferred method of procurement. Part V of this Act lays out the specifics of how an open tender should be conducted. Alternative procurement methods, subject to meeting the conditions set forth in Part VI, may be used when open tendering is not the appropriate method, such as in emergency situations. They include: Restricted tendering; direct procurement; Request for Proposal; Request for quotation; low level procurement among others. The findings of this study as it relates to the methods of procurement used are therefore in agreement with these provisions (Public Procurement Oversight Authority, 2009).

Officers involved in procurement of medicines were health facility in charges- nurses or clinical officers for rural health facilities and pharmaceutical personnel for hospitals. These participate in order generation. The county pharmacist, county procurement and county chief officer- health and sanitation are involved in rationalization of orders, forwarding to suppliers and subsequent payments. The need for having skilled personnel (nurses, clinicians and pharmaceutical personnel) was crucial to ensure effectiveness and proper quantification of medicines. It is also very important in elimination of errors such as over-estimation or under-estimation of the medicine's quantities. It is of essence to note that these staff should be highly qualified with high professional integrity. According to a study conducted by Ombaka (2009), pharmacists who work in hospitals to procure medications regardless of whether they are directly or

indirectly involved in procurement must be well versed in medications, the interacting issues, and the various stakeholders with the ability to influence the process or who may have legal responsibility.

Challenges faced in procurement of medicines from this study were inadequate funding, inadequate procurement personnel and long procurement processes. These could be addressed by allocating adequate funds as per the quantification needs for medicines in the county and hiring more procurement staff to reduce the lengthy procurement procedures. The finding compares well with what Mwathi and Osuga found out in 2014 particularly as it relates to funding (Mwathi and Osuga, 2014). The procurement process was noted to be exceedingly long, taking more than three months in some cases. This was mainly due to a lot of bureaucracy. Of particular interest was a strict requirement that the county chief officer in charge of health and sanitation signs each and every local purchase order, instead of empowering health facility in charges to do so. These findings are in agreement with those reported by the Economic and Social Rights Center- Hakijamii (2017) in Kakamega County that the procurement process for medicines was long, elaborate and bureaucratic.

4.7.3 Influence of inventory management practices on availability of medicines in public health facilities in Bungoma County.

Proper inventory management practices of medicines are essential in ensuring availability of medicines. However, this aspect has been accorded minimal attention especially in developing countries which ironically suffer the problem of lack of medicines. For example, until as late as 2009, Kenya's national malarial strategy lacked a supply chain management component (MOH, 2009). There continues to be more challenges as it regards supply chain management across the health sector- both public,

private and mission health facilities. This is mainly due to linkages within the health sector supply chain that are not strong enough to sustain access to essential medicines including those for management of infectious and deadly diseases (Riungu, 2010). In general, inventory management for medicines is supposed to ensure availability of medicines with specific goals of sustaining the highest health services level and reducing the associated costs of making orders and maintaining stock levels. In summary, it is ensuring that one has the right commodities, in adequate quantities, with respect to the right location and time at an affordable cost (WHO, 2007).

KEMSA was reported as the major supplier of medicines to public health facilities as compared to local suppliers. KEMSA is the preferred supplier of medicines in most public facilities since they have the advantage of affordable prices, trustworthiness as they are government owned among others. Comparing KEMSA prices with other suppliers, KEMSA's are lower since they buy medicines in bulk hence enjoying the advantages of economies of scale (UNIDO, 2010). They in addition, supply direct to the health facility, avoiding any transportation costs to be incurred. Since devolution of health care in 2013, the mandate to procure medicines shifted to the counties who have the discretion to either buy from KEMSA or any other supplier.

A majority of respondents reported that FEFO method was preferred when issuing medicines from the stores than FIFO. This allows use of medicines which are about to expire, sparing long expiry ones for future use. This finding is consistent with what Shadrack M *et al*., 2015 found in Meru County, Kenya. Designated Storage facilities were not available in close to half of the reported cases. This means that still many health facilities were storing medicines in places that were not fit for storage hence possibly interfering with the potency of the said medicines. From these findings, a significant number of respondents without designated stores were for FIFO method

which is not preferred as it has high chances of causing expiry of stock and stock outs in the long run. Probably, they chose this method as they were unable to properly arrange their medicines as a result of not having stores. Slightly more than half of respondents, who cited reduced utilization of medicines as a reason for expiry of medicines, did not have a designated store. Lack of designated stores has a direct relationship with expiry of medicines. This is because it is likely to lead to underutilization as health workers may not have an idea where the said medicines were stored. This may explain why most of those without stores indicated that they had expiries due to underutilization.

From these findings, it is evident that the frequency of ordering for medicines is irregular. For instance, at the time of data collection, the last time an order was ever made was almost eight months. This irregularity is however, only experienced in this post devolution era. Before devolution of health services to the county level, health facilities could order medicines from KEMSA quarterly. A standard order form designed by KEMSA was available at the health facilities which made their orders in accordance to the budgetary allocations referred to as drawing rights. The order value would not exceed the allocated quarterly drawing rights for a given health facility (World Bank, 2009).

Lack of medicines in public health facilities in Bungoma County was found to be in agreement with findings from a study by Muungu that has focused on one of the sub counties in Bungoma County with a bias on essential medicines. Proper inventory management practices were mentioned as a way of improving the availability of medicines in this study (Mungu, 2013). On average, the availability of medicines in the county was lower than that reported in other studies. On the same note, the average out of stock days were higher compared to those reported in several other studies (Bruno et

al, 2015). This low medicine availability is detrimental to provision of adequate health care since it is likely that patients miss medicines prescribed for them. They therefore go home without getting treated appropriately which could cause worse health outcomes.

The study found out that the county only had about forty pharmaceutical personnel which is an inadequate number. This is a very small number considering that there are so many health facilities in the county. From this finding, most of the health facilities operate without pharmaceutical staff, a fact which contravenes the legal provisions for the operation of pharmacy business in Kenya. Proximity of the supplier to the health facility was rated as important by a majority of respondents. A quarter of them rated this as extremely important. Supplier proximity is very important in a hospital set up since sometimes hospitals are faced with emergencies which need to be addressed immediately. It is thus prudent that the supplier is located within a close range to the health facility or if located far away, should make arrangements to have the medicines delivered in good time. Other factors considered in supplier choice included pre-qualification by the county government, past history of the supplier and suppliers' prices for medicines.

All the four challenges relating to inventory management as identified in this study: lack of proper storage, lack of a good inventory management system, inadequate staff and lack of inventory management SOPs are similar to those identified by other studies (Jabulani, 2005 & AMREF, 2007).

4.7.4 Influence of health care financing on availability of medicines in Bungoma County

Inadequate health care funding is one of the major factors affecting availability of medicines. It is evident that a majority of the world's population- up to a third have no access to essential medicines (WHO, 2004). The essential medicines concept was started by the World Health Organization (WHO) in 1977 and the idea was that a majority of the population will be able to access medicines they so much require. However, this is yet to be realized particularly in developing countries like Kenya due to inadequate budgetary allocation for healthcare hence budgetary constraints (UNIDO, 2010).

Bungoma County's estimated allocation towards health sector was about Kshs 2.6 Billion, translating to about 20 percent of the entire county budget. Comparing this to the 15% of the total budget as per the Abuja declaration (2001), it appears to be higher. However, a huge junk of this goes towards payment of salaries for health workers and other developmental projects. The amount left for medicines procurement is about Kshs 120 million (4.62% of the health budget). This is way too low compared to the then national government's allocation for procurement of medicines which was 36.64 % of the total health expenditure (MOMs, 2010). This percentage is also lower than what Webuye county referral hospital, which is one of the hospitals in Bungoma County allocated for medicines in 2012/2013 financial year. This is according to a study by Lucy Mecca which indicated that the hospital allocated an average of 9.12% for medicines out of their Facility Improvement Funds (FIF) in this particular period (Lucy WM, 2014).

With the low budgetary allocation above, more than half (53.1%) of respondents indicated that they had a budgetary deficit of between 31 to 40%. This is a wide

budgetary gap that accounts for the frequent stock counts of essential medicines in public health facilities. KEMSA, which is the government's entity responsible for supply of medicines and medical supplies in public health facilities, has had similar budgetary constraints. It was therefore unable to procure most of the items on its Essential Drug List (EDL). Out of the 343 items, it only procured 117 items (34.1%) (UNIDO, 2010).

From the findings of this study, there exists a strong relationship between inadequate funding and allocating funds for procuring medicines based on quantification. A majority of the respondents (43.8%) strongly agreed that inadequate funding was a key factor leading to stock outs of essential medicines in public facilities while another 46.9 plainly agreed. This compares well with a study by Mwathi and Osuga which found out that there was a significant relationship between funding and availability of medicines. Inadequate funding was the most strongly cited (57.9%) factor that caused unavailability of essential medicines in public hospitals (Mwathi & Osuga, 2014). Funding is very necessary in acquiring any property and therefore lack of it means acquisition of the said property will not be possible. Findings of this study are also similar to other studies for instance by Elliot (2008) and MOMs/ MOPHs (2009) which pointed out that inadequate funding among other factors such as expiry, high prices and pilferage affects accessibility to medicines (MOMs & MOPHs, 2009; Eliot 2008).

In general, major challenges relating to health care financing include allocation of very little funds for procurement of medicines and irrational budgeting where health sector is underfunded.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter outlines the summary, conclusions and recommendations of the study.

5.1 Summary

The objective of this study was to assess the influence of health system determinants on availability of medicines in public health facilities in Bungoma County. It was focused on three aspects: procurement process, inventory management practices and health care financing.

Findings on procurement process indicated that the process is very long owing to many steps and personnel involved. However, the entire process was followed by a majority of the respondents. Several factors were considered in supplier selection that included among others, prequalification by the county government, proximity of supplier to the health facility, suppliers' prices, and suppliers' past history. It was also noted that ordering for medicines was irregular especially post devolution era compared to a regular cycle pre- devolution. During delivery of medicines, several respondents reported that they had cases of discrepancies between quantities indicated on delivery notes and the actual quantities received.

Relating to inventory management practices, a significant number of respondents indicated that they did not have designated stores for medicines. Cases of expiry of medicines in the health facilities were reported by about 94% of respondents. The main reason(s) for these was reduced utilization for medicines and probably because of use of the FIFO method of inventory management instead of FEFO method. It was found out that a majority of the respondents reported having various inventory tools and

records. A significant number reported missing some of these inventory management tools. These included SOPs, standard treatment guidelines, Kenya Essential Medicines List among others. KEMSA remains the preferred supplier.

Healthcare financing aspects that directly have influence on medicines availability included the huge budgetary deficits of between 30% -50% as it relates to medicines procurement. Inadequate funding was the main reason frequent stock outs of medicines. It is important to be noted that very little out of the entire health budget was allocated to procurement of medicines. It was thus reported that allocation of funds be based on the findings and recommendations of a proper quantification process.

On average, the medicines availability situation was wanting with only 63.4% of the items required to be stocked in the county health facilities being available. The out-of-stock days for a quarter was about 51 days. These could be due to the reasons outlined above on the three health system determinants under study.

5.2 Conclusion

The three heath system determinants in this study: procurement process, inventory management practices and health care financing were found to have direct effects on the availability of medicines in Bungoma county's public health facilities. Good procurement practices, proper inventory management practices and adequate health care financing are important in ensuring continuous availability of medicines particularly in public health facilities. This in turn reduces frequent stock outs and possibility of expiry of medicines.

Inadequate health care funding was identified as a main determinant of availability of medicines. This should therefore be addressed with urgency since it has direct effects on health care which is so much dependent on health commodities and technologies.

5.4 Recommendations

The findings of this study indicate that there is a relationship between procurement process, inventory management practices and health care financing and availability of medicines in Bungoma county's public health facilities.

It is therefore important that the both the national and county governments review the existing procurement laws which seem to be discriminatory to some sectors especially health. The main area of focus should be the length of the procurement cycle and associated bureaucracies. These should be relaxed so as to make procurement of medicines particularly emergency essential medicines more effective.

Inventory management practices should also be up to date with health facilities having their own designated store and the county having a county store. Appropriate pharmaceutical staff should also be hired by the county government. These officers are key in providing their technical expertise in medicines inventory management. Guidelines and job aids that concern pharmaceutical inventory management need to also be availed for guidance of various aspects of inventory management.

Lastly, inadequate funding for health care should be addressed so as to ensure procurement of adequate medicines. Adequate budgetary allocation should be made so as to meet the diverse health care requirements and still spare enough for medicines procurement.

5.5 Recommendations for Further Research in this Field of Study

This study was based on Bungoma county's public health facilities with a focus on sub county hospitals. There is need to have a similar research targeting all the public health facilities in the county. This will give a clear perspective regarding the determinants of availability of medicines in the county.

Secondly, it would be important if a similar study is carried out in several counties so as to allow for comparison of research findings across several counties. In addition, a study that explores other health system determinants of medicines availability should be carried out. This is because availability of medicines particularly in public health facilities is dependent on several factors yet this study only focused on three: health care financing, procurement process and inventory management practices.

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APPENDICIES

Appendix I: Consent Form

Researcher: Nicholas Wakwabubi Barasa

Institution: Mount Kenya University

Research topic: Influence of health system determinants on availability of medicines in public health facilities in Bungoma County, Kenya.

The purpose of the research is to assess the influence of health system determinants on availability of medicines in public health facilities in Bungoma County.

The findings of this study will greatly benefit healthcare managers as they will be aware of the real issues that affect availability of medicines in the county's healthcare system. They will therefore be in a position to make sound decisions as it regards the supply of medicines.

Participants have been selected by considering their roles in management of medicines. The study will include the county pharmacist, medical superintendents, health administrative officers, pharmacists and procurement personnel of sub county hospitals, the head of county procurement department and the chief officer in charge of health and sanitation department in Bungoma County.

Interviews will last for at most 30 minutes. Questions may be asked to explore an observation in depth if necessary, depending on the nature of the observation.

Anonymity and confidentiality:

Anonymity standards will be enforced to protect personal information. The confidentiality of your comments will be maintained: they will not be attributed to you by name, role, or characteristics. You do, however, have the option of having your comments attributed to you. The audio recordings and transcripts will be coded, but no personally identifiable information will be examined.

You have the option to cancel at any time.

I, the participant, agree to the following:

I've been informed about the research topic and its goals, and I agree to take part.

I've talked to the researcher about any requirements for anonymity and confidentiality.

I agree to be audio- taped / video-taped during the interview

Participant's signature/ date: _____ Researcher's signature/ date: _____

Appendix II: Questionnaire

The information that will be obtained from this questionnaire will be solely used for the purpose of writing the research thesis. Confidentiality of personal information will be observed. Tick where necessary.

Personal/general information

1. Name of respondent (optional)

……...

2. Gender (tick) male female

3. Cadre (specify)……

4. Work experience (specify)…….

SECTION A: PROCUREMENT PROCESS

1. Does procurement process affect availability of medicines? Yes No
2. Who is responsible in making orders for medicines?

   Pharmacist in charge ()

   Pharmaceutical technologist in charge ()

   Any other pharmacy personnel ()

   Any other health worker ()
3. How often are the orders made?

   Weekly ()

   Monthly ()

   Quarterly ()

   Biannually ()

   Irregularly ()
4. How long does it take for an order to be delivered? ……
5. Are there adequate budgetary allocations for making orders? (yes) (No)

If no, what's the estimated percentage budget deficit?.....

6. What procedure does the health facility use to procure medicines? (tick)

   Open tendering ()

   Restricted tendering ()

   Negotiated tendering ()

   Request for quotation ()

   Direct tendering ()

   Others (specify)…….

7. Is the procurement process fully adhered to? yes no

8. Who are the major suppliers of medicines to the health facility? (tick appropriately)

   Local pharmacies()

   KEMSA ()

   MEDS ()

   Other ()

9. a) Does the supplier(s) deliver medicines direct to the health facility? Yes No

   b) If yes, is the delivery done on time? Yes or no? ……

c) If (a) above is no, how do the medicines reach the health facility?

   ……

10. Is the order fill rate 100 percent? (Yes) (No). If no, what are the reasons?

    Lack of medicines at the suppliers' premises ()

    Changes in prices of medicines ()

    Inappropriate specification ()

    Other ()

11. Are the medicines usually received in good condition? (Yes) (No). If no, what actions are taken?

    Rejection of the entire consignment ()

    Rejection of the specific medicine deemed not to be in good condition ()

    Receiving of the entire consignment regardless of its condition ()

12. What is your general comment as it regards the quality of medicines supplied?

    Good ()

    Average ()

    Poor ()

13. Are there incidences of discrepancies between received quantities and quantities on delivery notes? (Yes) (No). If YES, what action(s) are taken?

    Rejection of the entire consignment ()

    Rejection of the specific medicine over/undersupplied ()

    Receiving of the entire consignment regardless of it's the discrepancies ()

14. Please indicate the most important factors for supplier consideration. 1 – not important; 5- extremely important.

    Factor Scale

Reliability	1	2	3	4	5
Proximity to the health facility	1	2	3	4	5
Fair prices	1	2	3	4	5
Prequalification by the county government	1	2	3	4	5

B. INVENTORY MANAGEMENT

1. Does the health facility have access to the Kenya essential medicines list? Yes No
2. Are the records on consumption and stock status/ physical counts available? Yes No
3. Does the facility have a designated store for medicines? Yes No.

   If yes, who is in-charge of managing stores operations?

   Pharmacist/ pharmaceutical technologist ()

   Supplies chain manager ()

   Other professional (specify) ()

   How can you rate the security status of the store?

   Good ()

   Average ()

   Poor ()

   Are the records of medicines in the store available and up to date? (Yes) (No)

   How can you rate the general storage area?

   Good () Average ( ) Poor ( )
4. Are there standard operating procedures (SOPs) on pharmaceutical stores management? Yes No
5. What methods/procedures are followed when issuing medicines from the stores?

   First In First Out (FIFO) ()

   First Expiry First Out (FEFO) ()

   Last In Last Out (LIFO) ()

   Last Expiry First Out (LEFO) ()
6. Are the standard treatment guidelines observed for example, testing before treating malaria? Yes No

7. Are there any reported cases of expired medicines in the last three months? (Yes) (No). if yes, kindly give reasons for expiries

   Overstocking ()

   Reduced utilization of medicines ()

   Inappropriate stores arrangement ()

   Items received as short expiry items ()

8. Have there been reports of pilferage of medicines from the facility? Yes No

9. Does the facility have a medicine management system? Yes No

   If yes what type of system is it?

   Electronic medicine management system ()

   Manual medicine management system ()

10. Have you experienced stock outs in the following categories of medicines in the last three months?

		Out of stock days
Antimalarials	yes	No
Antibiotics	yes	No
Anti-hypertensives	yes	No
Antidiabetics	yes	No
Common analgesics	yes	No
Paediatric medicines	yes	No
Emergency medicines	yes	No

11. What are the reasons for the stock outs?

Factor	*Scale*				
Inadequate funding	1	2	3	4	5
Irrational medicines use/ improper inventory management	1	2	3	4	5
Procurement challenges	1	2	3	4	5

C. HEALTH CARE FINANCING

1. What is the source of finances for procurement of medicines?

   County government ()

   National government ()

   Own institutional funds ()

   Partners/ donors ()

   All the above ()

2. In your own opinion, is the amount allocated for procurement of medicines adequate? (Yes) (No)
3. What is the estimated percentage of medicines that the allocated funds procure?
4. Have you received any training in financial management? Yes No

   If yes, how has this helped your role in medicines management?

   Proper budgeting ()

   Rational expenditure ()

5. Please indicate the most appropriate way(s) of financing health care with focus on medicines supply. 1- not important, 5- extremely important.

   Factor scale

Have a revolving fund for medicines procurement	1	2	3	4	5
Prioritize procurement of medicines	1	2	3	4	5
Allocate funds for medicines as per quantification requirements	1	2	3	4	5
Centralize procurement funds at the county level	1	2	3	4	5
Decentralize procurement funds to sub counties	1	2	3	4	5

Appendix III: In Depth Interview Schedules

1. What is the medicines availability situation in the county?
2. How can you rate the medicines procurement process?
3. How long is the procurement process?
4. Who are involved in the procurement process?
5. In your opinion what are the main challenges in relation to medicines procurement?

   How can they be addressed?
6. What factors influence supplier choice?
7. Are all procurement procedures followed?
8. What is the estimated budgetary allocation for the health department? ……

   What percentage of the whole budget is this?.....

   In your own opinion, is it adequate?.....
9. What is the budgetary allocation that goes into medicines procurement? Is it adequate?
10. What are the main concerns relating to healthcare financing in general and medicines financing in particular? How can they be addressed?
11. Regarding inventory management of medicines:

Is there a central store for the entire county?

Which health professionals are mandated with inventory management of medicines across the county?

Does the county have a standard list of medicines that need to be available in health facilities?

Are there standard treatment guidelines for management of various diseases?

Is there a copy of the latest Kenya essential medicines list? Is it regularly used during selection of medicines for procurement?

Does the county have adequate number of pharmaceutical personnel? What is their total number?

Are these professionals trained in medicines inventory management?

Are there standard operating procedures for medicines inventory management developed by the county for use at the health facilities' level?

How often are medicines orders made?

What are the main challenges relating to medicines inventory management across the county's health facilities? How can they be addressed?

Appendix IV: Checklist

Name of medicine	Available on day of visit(Y/N)	Days out of stock	remarks
Albendazole Tablets 400mg			
Amitriptylline Tablets 25mg			
Amoxicillin Capsules 250mg			
Amoxicillin/clavulanic acid tablets			
Azithromycin tab 500mg			
Cetrizine tabs 10mg			
Ciprofloxacin Tablets 500mg			
Cotrimoxazole Tablets 480mg			
Digoxin Tablets 0.25mg			
. Doxycycline cap 100mg			
. Enalapril Tablets 5mg			
. Ferrous sulphate tab. 200mg			
. Flucloxacillin 250mg caps			
. Folic acid tab 5mg			
. Glibenclamide Tablets 5mg			
. Hydrochlorothiazide Tablets 50mg			
. Ibuprofen Tablets f/c 200mg			
. Metformin Tablets 500mg			
. Methyldopa Tablets 250mg			
. Metronidazole Tablets 200mg			
. Misoprostol Tablets 200mg			
. Omeprazole Capsules 20mg			
. ORS Zinc Co Pack			
. Paracetamol Tablet 500mg			
. Loperamide Capsules - 2mg			

. Phenobarbitone Tablets 30mg						
. Potassium Chloride Tablets						
. Prednisolone Tablets 5mg						
. Sulphadoxine/pyrimethamine Tablet,500/25mg						
. Amoxicillin syrup 125mg/5mL 100ML						
. cetrizine 5mg syrup						
. Amoxicillin/clavulanic acid oral suspension						
. Cotrimoxazole susp 240mg/5mL 100ml						
. Metronidazole oral susp200mg/5mL 100ml						
. Nystatin suspension,100,000iu/ml						
. Paracetamol suspension 120mg/5mL 60ml						
. Adrenaline inj 1mg/1ml amp						
. Atropine Injection 0,6mg/ml						
. Salbutamol nebulizing solution						
. Benzathine penicillin inj 1.2 MU pfr						
. Benzylpenicillin inj600g(1 MU)vial(pfr)						
. calcium gluconate inj						
. Ceftriaxone inj 1g (pfr)						
. Chlorpheniramine inj 10mg/1mL amp						
. Dental catridges Lignocaine 2%/ Adrenaline						
. Dexamethasone Injection 4mg/ml						
. Ephedrine inj 25mg/ml						
. Frusemide Injection 20mg/2ml						

.	Gentamicin injection 40mg per mL, 2mL amp					
.	Dextrose 10%, 500mL					
.	Dextrose 5%, 500mL					
.	Dextrose 50%, 100mL					
.	Heparin inj 5,000 IU/mL, 5mL vial					
.	Hydrocortisone inj 100mg vial					
.	Hyoscine Butylbromide inj 20mg/ml Amp					
.	Biphasic insulin 30/70 100 IU/mL. 10mL vial					
.	Soluble insulin 100 IU/mL, 10mL vial					
.	Lidocaine (lignocaine) inj 2% 30mL vial					
.	Magnesium sulphate inj 50%, 10mL amp					
.	Metoclopramide inj 10mg/2ml					
.	Metronidazole inj 5mg/mL, 100mL vial					
.	Oxytocin inj 10 IU/mL, 1mL amp					
.	Paracetamol Injection 150mg/ml					
.	Phytomenadione (Vit K) inj 2mg/ml amp					
.	Potassium Chloride inj					
.	Quinine inj. 600mg/2ml					
.	Sodium bicarbonate 8.4%, 10ml					
.	Sodium chloride IV infusion 0.9%, 500ml					
.	Sodium lactate co IV infusion, 500ml					
.	Water for injection 10mL amp					
.	Benzhexol Tablets 5mg					
.	Carbamazepine Tablets 200mg					

.	Chlorpromazine inj 25mg/mL, 2mL amp*					
.	Chlorpromazine Tablets 100mg					
.	Diazepam inj 5mg/mL, 2mL amp					
.	Fluphenazine injection 5mg/1mL ampoule					
.	Haloperidol Injection 50mg/ml, 1ml ampoule					
.	Haloperidol 5mg tablets					
.	Phenytoin Tablets 100mg					
.	Morphine injection					
.	Morphine reconstitution powder					
.	Atracurium besylate inj. 10mg/ml					
.	Bupivacaine heavy spinal inj5mg/mL4mL amp					
	Halothane inhalation, 250ml bottle					
	Isoflurane inhalation, 250ml bottle					
	Ketamine					
	Neostigmine injection					
	Pancuronium injection					
	Propofol inj 10mg/ml 20ml					
	Suxamethonium					
	Thiopentone					
	Anti D immunoglobulin inj 300ug					
	Anti-Snake Venom (African - Tropicalized)					
	Rabies Vaccine (Verorab) 0,5ml vial					
	Typhoid vaccine					
.	Benzyl benzoate lotion					
	Chlorhexidine gel 4%					
.	Clotrimazole cream 1% 20g					
.	Clotrimazole pessary 500mg 1s					

	Hydrocortisone ointment 1% 15g					
	Paracetamol suppositories 125mg					
	Salbutamol inhaler 100mcg 200doses					
	Silver sulphadiazine cream 1% 250g					
	Gentamycin Eye/Ear Drops					
	Tetracycline eye ointment 1% 5g					
	Artemether/lumefantrine Tablets					
	Artesunate inj 60mg					
	Depot Medroxyprogesterone acetate					
	Etonogestrel implant 68mg					
	Levonorgestrel implant 75mg					
	IUD Copper T Combined oral contraceptive (COC)					
	Levonorgestrel tab 30mcg (POP)					
	Levonorgestrel tab 750mcg (EC), Pair					

Appendix V: Certificate of Ethical Clearance

Mount Kenya University

SEPTEMBER 11, 2017

Ref. No. MKU/ERC/0462

CERTIFICATE OF ETHICAL CLEARANCE

This is to certify that the proposal titled **"INFLUENCE OF HEALTH SYSTEM DETERMINANTS ON AVAILABILITY OF MEDICINES IN PUBLIC HEALTH FACILITIES IN BUNGOMA COUNTY, KENYA"**, whose Principal Investigator is Mr Nicholas Wakwabubi Barasa (MPH/2015/24871) has been reviewed by Mount Kenya University Ethics Review Committee (ERC), and found to adequately address all ethical concerns.

Mr Francis W. Makokha
Secretary, Mount Kenya University ERC

Sign: _____ **Date:** 11/09/2017

Prof. Francis W. Muregi
Chairman, Mount Kenya University ERC

Sign: _____ **Date:** 11/09/2017

The Chairman
Mount Kenya University
Ethics Review Committee
P. O. Box 342 - 0100, Thika

Appendix VI: Letter School of Post Graduate Studies, Mt. Kenya University

Mount Kenya University

SCHOOL OF POSTGRADUATE STUDIES

REF: MPH/2015/24871

26th September, 2017

The Director, Research Coordinator Division
National Commission for Science, Technology & Innovation
Utalii House, 8th & 9th Floor
P.O Box 30623 – 00100
Nairobi

Dear Sir/Madam,

RE: NICHOLAS WAKWABUBI BARASA - REGISTRATION NO – MPH/2015/24871

The purpose of this letter is to introduce the above named student who is pursuing Degree of Master of **Health Services Management** in the Department of **Epidemiology and Biostatistics** in the School **of Public Health.**

The title of his research is *"Influence of Health System Determinants on Availability of Medicines in Public Health Facilities in Bungoma County, Kenya."*

He has been cleared by the University's Ethics Review Committee (Certificate attached) and now needs to proceed to the field to collect data for his research between **September and December 2017**.

Any assistance accorded to him will be highly appreciated.

Thank you.

Mount Kenya University
Dean, School of Postgraduate Studies
P. O. Box 342 - 01000
Thika

Dr. Samuel Karenga
Dean, School of Postgraduate Studies

Enc

Appendix VII: Research Permit from NACOSTI

THIS IS TO CERTIFY THAT:
DR. NICHOLAS WAKWABUBI BARASA
of MOUNT KENYA UNIVERSITY,
193-50200 BUNGOMA,has been
permitted to conduct research in
Bungoma County

on the topic: *INFLUENCE OF HEALTH SYSTEM DETERMINANTS ON AVAILABILITY OF MEDICINES IN PUBLIC HEALTH FACILITIES IN BUNGOMA COUNTY, KENYA*

for the period ending:
3rd November,2018

.....
Applicant's Signature

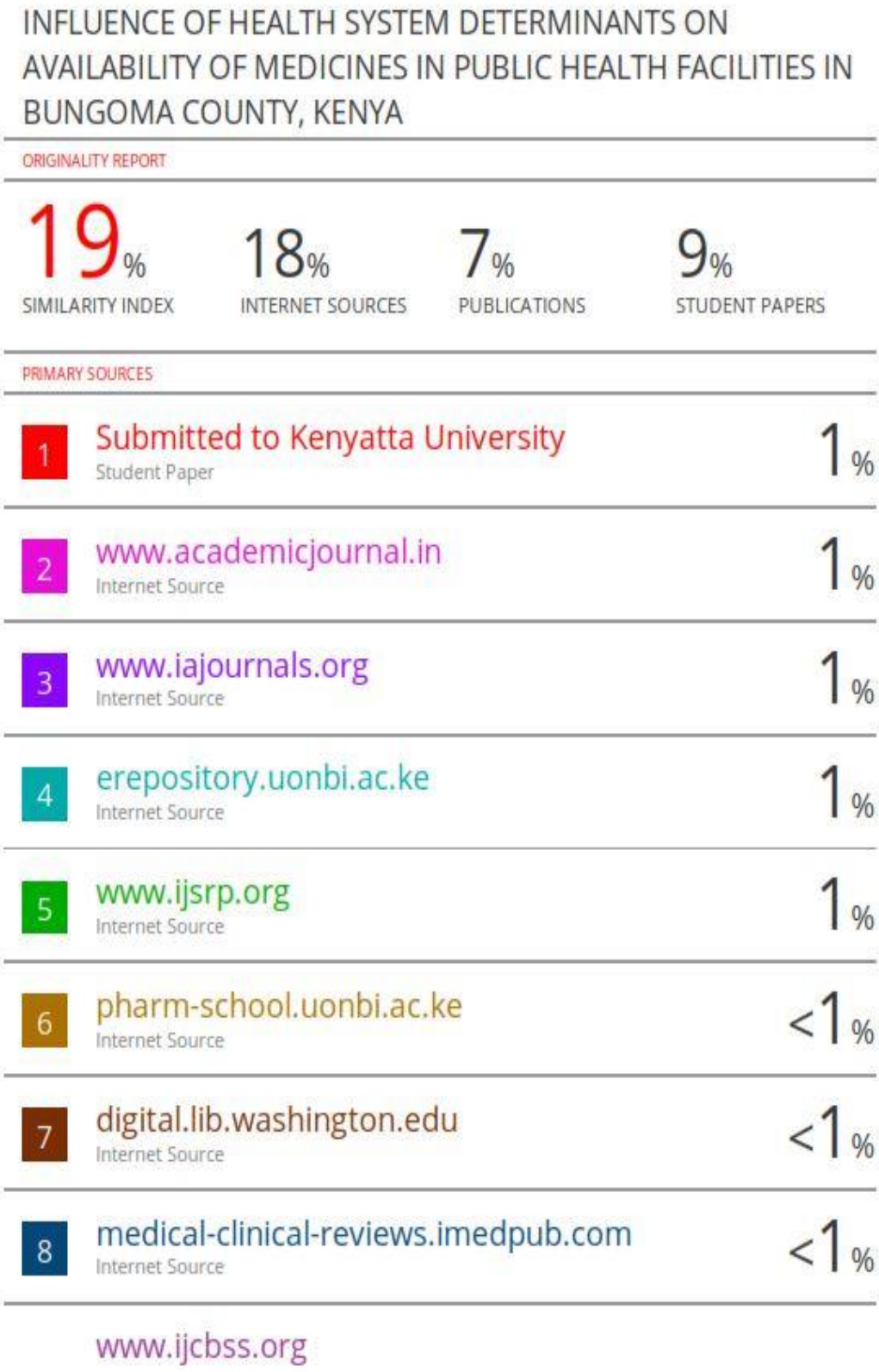
Permit No : NACOSTI/P/17/42297/19705
Date Of Issue : 3rd November,2017
Fee Recieved :Ksh 1000

.....
Director General
National Commission for Science, Technology & Innovation

Appendix VIII: Map of Bungoma County

Source: Mary Stella W, Jacob Wanambacha W, Stanley O, (2015).

Appendix IX: Similarity Index



INFLUENCE OF HEALTH SYSTEM DETERMINANTS ON AVAILABILITY OF MEDICINES IN PUBLIC HEALTH FACILITIES IN BUNGOMA COUNTY, KENYA

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